LAY PERCEPTIONS OF ANIMAL CULTURE

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Abstract

In our society, animals are a frequent part of our everyday lives. From entertainment, such as TV shows and zoos, hobbies such as bird watching and fishing, and everyday uses such as service animals and family pets, animals are undeniably intertwined with human life. Humans have a tendency to categorize and compare things in the world around them, and the way humans think about animals is no exception. Individuals have a tendency to compare animals to humans, but does this comparison extend to thinking about the potential for animal cognition and culture? I conducted two studies to explore the lay perception of animal's cognitive abilities and capacity for culture, focusing on cultural beliefs (e.g., religious identification, belief in reincarnation, belief in evolution) that may impact this lay perception. The first study uses a focus group interview design, and the second study is a quasi-experiment that looks at the role of religious beliefs and putting oneself into a science versus religious mindset play in our categorization and perception of animals.

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Lay Perceptions of Animal Culture

"There is, in fact, so much resistance to the idea of animal culture that one cannot escape the impression that it is an idea whose time has come. The air is filled with claims and counterclaims; everyone has an opinion, and a strong one at that" (de Waal, 2001, p. 13).

From Hollywood blockbusters like *Planet of the Apes* and *The Secret Life of Pets,* binge-worthy Netflix shows such as *Tiger King* and *BoJack Horseman*, to popular children's stories such as *The Little Red Hen* and *Olivia* (Burke & Copenhaver, 2003), the animal–human relationship seems to be an integral part of our social life. Many pop-culture depictions show animals not only interacting with humans, such as humans owning animals as pets or humans and animals interacting as friends in society, but also interacting within their own unique societies or cultures consisting of different norms, beliefs, and traditions. While anthropomorphism, or giving animals[1] and objects human characteristics, seems to be commonplace among the lay population, the debate over whether or not animals actually have culture remains a gray area within the scientific community (Horowitz & Bekoff, 2007). Putting aside whether animals actually have culture, the current paper asks: what are lay perceptions of animal culture, and what factors might influence these perceptions? I conducted this study to examine factors that might influence lay perceptions, leading to the "strong opinions" and "resistance" many people feel towards the idea of animals having culture (de Waal, 2001, p. 13). Specifically, I examine cultural and religious differences in individuals and how they may impact views and perceptions of animals and their capacity for culture.

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[1] "Animals" will refer to all non-human animals throughout the proposal unless otherwise noted.

Definitions of Culture

Historically, the academic answer to whether or not animals have culture has not been as clear, but the debate has been active in many fields. Philosophers such as Aristotle, evolutionists such as Baldwin and Darwin, primatologists such as Frans de Waal, and many others have contributed to the animal culture debate over centuries (de Waal, 2001; Laland & Janik, 2006). So, why has the debate persisted this long? One possibility for why the scientific community cannot come to a consensus on the animal culture debate comes from the way that we define culture. Definitions of culture, even from within the same field, can vary greatly.

Depending on how we define culture, the concept may appear to be either uniquely human or open to other non-human animal species (Laland & Hoppitt, 2003). Throughout the scientific fields that study culture, there are many different definitions of what constitutes culture. On the one hand, cultural anthropologist Shweder (1995) defines the sociocultural environment as an "intentional world," stipulating cultural psychology as a "human science." On the other hand, Whiten (2021) defines culture as a behavior that is learned socially and passed down through generations, emphasizing that this process is not unique to humans. Though academic definitions of culture over the years have not always included animals, more recently researchers have claimed that culture, in its essence, is not distinctive to humans. For example, Whiten (2021) discusses behavioral phenomena from whale vocalizations to fruit flies' breeding preferences, noting them as examples that have been used within the field as examples of animals showing "culture".

In the context of this study, I am interested in the lay perceptions of culture. As a researcher, my definition of culture relies on a combination of definitions: an intentional world that is learned socially and passed down which may include things such as religion, social norms,

values, and practices. Although researchers have not yet focused on perceptions of animal culture, they have examined other topics related to the human perception of animals and animal behavior, for example, animal cognition and sentience.

Perceptions of Animal Cognition

There is a large body of research examining animal behavior and the cognitive abilities of animals. For example, Pepperberg's research with an African Grey Parrot named Alex has examined language development and reasoning (Melson, 2002), Gallup's research found chimpanzees are capable of self-recognition in a mirror (Gallup, 1970), and Foerder and colleagues (2011) examined problem-solving skills in Asian elephants. While some audiences may take this as evidence for similar cognitive abilities between animals and humans, some animal behavior researchers still maintain that even if animals and humans do share some abilities, in general animals and humans think very differently from each other (Wynne, 2013). Although this line of research dives into whether or not animals are *capable* of cognition, a separate issue is people's psychological *perceptions* of what animals think and how that may differ from humans. These perceptions tend to vary widely by researchers and the lay community.

Callahan and colleagues (2021) found that lay people tended to differentiate perception of animals' capacity for thought among different groupings of animals (i.e., mammals, fish, and birds), and they tended to also differentiate between cognitive and emotive traits (i.e., problem-solving vs. grief). For example, participants rate dolphins and elephants as having a greater capacity for both emotive and cognitive traits than fiddler crabs and earthworms. In general, participants tended to believe animals have higher cognitive capability than emotive capability,

and participants tended to rate mammals as the animal group with the highest cognitive and emotive capability, followed by birds, reptiles, amphibians, and fish.

In addition to studying beliefs about animals' capacity for cognition, Phillips and McCulloh (2005) explored cross-cultural perceptions of the sentience of animals, or an animal's ability to sense and perceive the world around them, among college students in multiple countries. They found differences in perceived sentience depending on the specific animal being evaluated.

Additionally, their research found differences in these perceptions depending on culture. For example, there were no cultural differences in the perceived sentience of dogs or monkeys, but some cultures were more likely than others to highly rate sentience in chickens (e.g., greater in Asian countries compared to Poland) and rats (e.g., Taiwan and China compared to Korea, Poland, and Japan; Phillips & McCulloh, 2005). In another example, Nakajima and colleagues (2002) found participants within the United States rated animals as higher on intelligence than participants from Japan. Throughout these studies, researchers proposed that these findings were likely due in part to differences in religious and other cultural traditions feasible because of the different scriptures or values surrounding animals in individual traditions (e.g., believing that the same soul may be capable of reincarnating between an animal and human in different lives; Phillips & McCulloh, 2005).

Investigating whether or not animals are capable of thoughts and emotions has begun to open the conversation around potential animal capability more broadly. In addition to examining the issue of cognition in animals, researchers have begun to examine the lay perception of animals' cognitive abilities. But what about the perception of animals' capacity to have culture, above and beyond basic cognitive abilities? Do individuals believe that there is a difference

between higher level cognitive abilities and culture, or would having higher level cognition automatically equate to culture in lay people's minds? Do people tend to draw on their own personal cultural and religious beliefs when making considerations about animals?

Cultural and Religious Differences in Human–Animal Relationships

Relationships between humans and animals have come in many forms throughout history such as keeping animals as pets and in zoos, hunting and eating animals (or actively choosing not to consume animal products), animals being symbolic within specific cultures, and references to animals within religious doctrines. These cultural differences in animal–human relationships may impact not only how individuals interact with animals, but also how they perceive animals. Beyond individual perceptions of animals, research has shown that animal welfare is highly important cross-culturally, and at the same time, there are cultural differences in attitudes towards the value of animal life (Phillips & McCulloch, 2005; Sinclair & Phillips, 2017). Despite animal welfare being highly important cross-culturally, there may also be cultural differences in how people are exposed to nature and animals (Ross et al., 2003; Waxman et al., 2014). For example, some Native American cultural traditions tend to focus on educating about animals, plants, and other natural products relating to their tribe's traditional land and practices (Ross et al., 2003). Although human ethnicity or nationality are often used as proxies for what lay people think of as culture, researchers have identified other distinctive forms of culture, notably, religion, region, and social class (Cohen, 2009). Knowing this, I sought out to examine how individual cultural beliefs, specifically their religious beliefs, may play into how individuals consider animals' capability for higher cognitive function and culture.

Differences in how we interact with and think about animals have been studied within various religious contexts. Within Christianity, for instance, questions have centered around

whether or not pets go to Heaven or have a soul, or whether the belief in being made in God's image puts humans above animals (Lawrence, 1995). Additionally, within the Abrahamic religions[2], human usage of animals has been laid out in millennia-old traditions and teachings (e.g., dietary practices such as keeping Kosher or religious practices of animal sacrifice; Jegatheesan, 2015). On the other hand, many Eastern religious and cultural traditions have denounced animal sacrifices, increased the status of animals within the society, and emphasized a belief in animal souls within the context of reincarnation (Jegatheesan, 2015). Hinduism specifically discusses the idea of animals being in their own realm of existence, albeit a lower realm than humans (Hui & Coleman, 2012). These religious differences in beliefs surrounding animals are not limited to the more common world religions but are existent within most cultures and religions worldwide. These examples of cultural differences in how we think about and interact with animals just begin to crack the surface of why researchers have begun considering cultural differences as motivators for folk-biological or anthropomorphic differences in reasoning.

In addition to religion, other cultural factors may be at play within the differences of human–animal relationships. Living in an urban versus rural area may impact how we value and consider the animals in our lives. Specifically, those living in a more urban area may be more likely to keep an animal in their home as a member of the family, whereas rural areas may keep dogs outside for working purposes (i.e., hunting, herding, guarding, etc.; Ross et al., 2003). Additionally, those living in a more natural, rural environment may have more general exposure and knowledge of surrounding animals than those living in urban environments or nature may have religious or cultural significance (Brown, 2016; Ross et al., 2003). Ross and colleagues

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[2] Abrahamic religions refer to Judaism, Christianity, and Islam.

(2003) examined this idea further by looking at perceptions of animal folk biology within urban cultural majority (i.e., White, European Americans living in an urban setting), the rural majority (i.e., White, European Americans living in a rural setting), and rural minority (Menominee) populations, finding evidence that anthropomorphic reasoning is universal across these different cultural groups. Specifically, when asking children about novel biological comparisons (e.g., humans have *andros*, a word made up by researchers[3], inside; do wolves have *andros* inside like humans do?), researchers found that Menominee children, who likely had more exposure to animals and the natural world, show little to no anthropomorphic reasoning, whereas with the urban majority and rural majority groups, anthropomorphic reasoning and human-centered thinking is prominent, though it tapers earlier in rural majority participants (Ross et al., 2003). Their results suggest that beliefs about animals and folk biology more broadly may be impacted by multiple cultural factors (i.e., rural v. urban, Menominee v. White, European American).

Building on these findings, Waxman and colleagues (2014) added a natural (animal encyclopedia) versus anthropomorphic (Berenstain Bears) prime to this reasoning task. Researchers first taught the children about the novel biological information (i.e., *andros*), exposed them to either the natural or anthropomorphized prime, and then tested their biological reasoning (i.e., do X have *andros*; Waxman et al., 2014). Results showed that those individuals who read the Berenstain Bears prime were more likely to show human-centered, anthropomorphic reasoning than those who were exposed to the natural prime, suggesting that on top of what we typically think of as culture, differences in media exposure may also play a role in how we think about animals (Waxman et al., 2014).

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[3] A technique commonly applied in cognitive development studies, made-up words like *andros* are used to gauge children's understanding of concepts without the concern of biases with words that children may have already learned (e.g., heart).

Beyond exploring beliefs about folk biology, religion and science primes have been commonly used quasi-experimentally to explore differences in beliefs and behaviors of different religious and cultural groups. For example, Cavrak & Kleider-Offutt (2015) found that priming with religious symbolism (i.e., a crucifix) led participants to rate situations as less morally acceptable when presented with morally ambiguous situations. This finding held for both religious and non-religious participants, though the prime was more effective for religious participants (Cavrak & Kleider-Offutt, 2015). Additionally, priming participants with religion both explicitly (i.e., the word God versus Gub) or implicitly (i.e., researcher wearing a cross necklace) has been shown to increase self-predicted prosocial behavior (i.e., intent to volunteer and organ donation) particularly for religious individuals (Guéguen, 2015; Lin et al., 2016). Knowing that primes relating to religion and science have been shown to impact beliefs and behaviors of participants, these primes may also impact beliefs surrounding animals, which can be directly related to an individual's cultural or religious belief system.

Overview of the Current Research

Although the conversation surrounding how animals think and whether or not animals have culture has persisted within the academic and lay community, the conversation and research that does exist has typically focused on the animals and whether or not they *actually have culture* rather than looking at *perceptions of animal culture* and what beliefs may be influencing these differences in perceptions. In other words, we know the debate exists, but we do not have research focusing on these lay perceptions and why there is such disagreement on whether or not animals have culture.

Seeing that there are cultural differences in how individuals consider and categorize animals, religious versus science-based views may be useful for understanding why the animal

culture debate persists. Perhaps those who are exposed to religious views or hold those views themselves may be less willing to accept that animals, like humans, have their own culture. For example, Christian beliefs that animals do not have souls and are "less than" humans or Jewish and Muslim dietary restrictions to avoid contact with dirty animals may lead to beliefs that animals are inherently different from humans. On the other hand, those who have a consistently more "naturalistic" view of animals, without considering religious views surrounding animal and human separation may be more likely to accept culture as a shared characteristic between humans and animals. Because individuals vary in their endorsement of different religious components (e.g., belief in creationism, reincarnation, and evolution), it will be important to explore how religious beliefs or exposure to religion versus science concepts may impact perceptions of animals, specifically animal culture.

I conducted two studies to examine lay perceptions of animal culture: 1) a qualitative focus group interview to investigate how individuals think about and define human versus animal culture and 2) a quasi-experiment to examine key situational factors (religious setting vs. a science-based setting) that may influence perceptions of animal culture. In general, I hypothesized that there would be individual differences in perceptions of whether or not animals have culture (i.e., that the animal culture debate would be reflected in the interviews) and that perceptions may vary, in part, due to particular situational factors or personal beliefs. The results of these studies could provide a foundation for understanding cultural differences in beliefs about animal culture as well as beliefs about animals more broadly.

Study 1

Academic conversations surrounding whether or not animals have culture often focus on finding evidence for or against animal culture. Throughout this project, I sought to explore

different reasons that may help explain why this debate has persisted. My first step towards

dissecting this topic was to conduct an exploratory focus group interview to understand what

perceptions and beliefs may exist in regard to animal culture. I developed my focus group

interviews with the underlying research question: how do people define animal cognition and

culture, and what factors may influence why they believe (or do not believe) that animals are

sentient and have culture? My main hypotheses for Study 1 were twofold:

> H1: I hypothesized that there would not be a uniform perception of whether or not
>
> animals have cultural and cognitive abilities.
>
> H2: I predicted that certain animal groups would be less likely to be labeled as having
>
> culture by participants — namely insects, reptiles, and fish, while others would be more
>
> likely to be labeled as having culture — namely mammals. This prediction falls in line
>
> with Callahan and colleagues' (2021) findings discussed above about perceptions of
>
> animal cognition with mammals as the animal group with the highest and cognitive
>
> emotive capability followed by birds, reptiles, amphibians, and fish.

I also explored whether the variation in perceptions of animal culture may be linked to cultural

factors, namely religious beliefs, discussed by participants during the discussion or within their

survey and demographics, but I did not have clear predictions about the direction of these

associations.

Method

Participants

I recruited 38 participants to complete my focus group interviews (Onwuegbuzie et al.,

2009). Participants were recruited from the University of Hawaiʻi at Mānoa subject pool.

Participants were compensated for their time with course credits via SONA. The focus group

took approximately 60 minutes per session. In the first 45 minutes, participants were asked

interview questions (Appendix B), and in the last 15 minutes, they were asked to complete a

Qualtrics survey that measured beliefs about animals and personal demographics (Appendix A).

Since many of the questions included in the focus group interviews are discussion-based, a

minimum of two participants were required to run each focus group session ($M = 3.167$). In

instances where only one participant signed up for or attended a particular session, I rescheduled

them for another session in which two or more participants are available (Onwuegbuzie et al.,

2009). Participants were mainly female (Female = 81.6%, Male = 18.4%) between the ages of 18

and 31 ($M = 20.2$). Additionally, participants represented a variety of racial, ethnic, and religious

backgrounds (See Table 1).

Procedure

Each focus group took place virtually over Zoom[4]. In addition to the participants, each

focus group session included myself and another researcher from the Culture and Religion Lab.

Participants were asked to leave their cameras on for the duration of the session and were

notified that the session was being recorded for transcription purposes. When participants joined

the Zoom session, they were sent a Qualtrics survey link containing the consent form to read

over and virtually sign prior to starting the interview. Once participants completed the consent,

the experimenter began the focus group. Conversations within the focus group were open-ended

but focused on participants': 1) definitions of culture, 2) beliefs about whether or not animals

have their own culture, and 3) reasons why they may (or may not) believe that animals have

culture. After the focus group interview, participants were asked to take a survey with

demographic and culture-related questions (Appendix A). Interview questions can be found in

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[4] At the time of Study 1, running via Zoom was the recommended method of data collection to comply with COVID-19 safety protocols set by the University IRB.

Appendix B, but each discussion was unique to the focus group: additional, unplanned discussion points came up in each session. Prior to launching the study, one pilot focus group interview was held using research assistants from the Culture and Religion Lab and graduate students from the department. This helped to ensure planned questions were easily understandable, to see if there were any questions that needed to be added or removed prior to running the focus group interview, and to give the research team a chance to test-run Zoom sessions prior to running the focus group with real participants.

Measures

Qualitative Questions. Study 1 measures consisted of a combination of qualitative, open-ended questions during the focus group and demographic and quantitative measures within the Qualtrics survey. Within the focus group interview, I asked participants broadly about beliefs surrounding culture and animal culture as well as questions modified from the "Into the Animal Mind Survey" generalized for beliefs about all animals more broadly rather than specific animals (Appendix B; Callahan et al., 2021). Themes of the focus group sessions were definitions of culture, perceptions of animal culture, beliefs about animal's cognitive, sentience, and language capabilities, and potential explicit reasonings for beliefs surrounding animals.

Animal Cognition. After completing the qualitative portion of the focus group, participants completed the "Into the Animal Mind Survey," which measured whether or not participants believed animals, in general, were capable of a variety of cognitive, sentient, and cultural behaviors and abilities (e.g., appreciating art, experiencing guilt, and problem solving; 1 = "Not capable at all", 10 = "Extremely capable"; high values indicate a stronger belief that animals are capable of sentience and higher cognition; Cronbach's alpha = .95; Appendix A2; Callahan et al., 2021).

Human Use of Animals. Participants also took the "Belief about the use of animals in society" survey where they responded to various questions about how animals should or should not be used by humans (e.g., eating, animal testing, etc; 1 = "Disagree very strongly", 7 = "Agree very strongly", high values indicate a stronger belief that animals can be used to better human life; Cronbach's alpha = .78; Appendix A3; Phillips & McCulloch, 2005).

Demographics and Exploratory Animal Belief Items. Demographic questions, including age, gender, ethnic and racial background, religious affiliation, and socioeconomic status, were included for participants during the survey. In addition to demographic questions commonly used within social psychology, I also included additional questions that I believed to be relevant to perceptions of animal culture, for example, belief in reincarnation and previous personal experiences with animals: past and current pet ownership (Y/N), recent trips to zoos and aquariums (Y/N), and self-perceived wildlife knowledge (1 = "Not Knowledgeable at All", 7 = "Very Knowledgeable"; Appendix A1).

Results

Qualitative Data

All meetings were recorded, and the audio recordings from Zoom were run through NVivo transcription services. The transcripts were then checked for any errors, labeled by participant ID, and analyzed using thematic analysis (Braun & Clarke, 2006). Thematic analysis is a method of analyzing qualitative data that gives researchers the structure and ability to find patterns and themes within qualitative data while still allowing for flexibility (Braun & Clarke, 2006). After transcripts were cleaned, steps for analyzing included reading through each of the individual focus group transcripts multiple times and looking for common themes that emerged. Although I split the focus group questions into broader themes, I did not know what specific

patterns would emerge throughout the interviews. I anticipated that there would be debate between participants over whether or not animals had culture and suspected a perceived hierarchy of ability for animal categories (e.g., mammals, reptiles, etc.) mirroring previous research, but I did not have specific expectations about the animal examples brought up. Throughout the following qualitative analyses, I will be discussing specific themes and patterns that arose, both explicitly mentioned qualitative responses by participants and exploratory correlations that arose with quantitative data.

Definitions of Culture. To start off the focus group, I wanted to get a better idea of what exactly participants were thinking about when discussing culture. For this reason, we began with a discussion on what culture is and examples of culture. When defining culture, there were many themes that appeared across most, if not all groups. Based on the patterns across groups, I came up with the following definition:

Culture is defined by shared beliefs, customs, values, and practices that occur across groups such as families, communities, social categorizations (e.g., race or ethnicity) and broader societies (e.g., America) and are passed down to others. Specific examples of things that clearly represent culture are: food, music, religion, clothing, holidays, and languages.

In addition to defining culture and giving examples, participants were asked whether or not they believed that all people have culture. Most participants stated that all people are *at the very minimum* capable of having culture but that individuals may not accept being part of a particular culture, may not learn the cultural practices and beliefs, or may not be aware that they are part of a particular culture.

Belief in Animal Culture. During the focus group interviews, after discussing as a group

what culture is and specific examples, participants were asked whether or not they believed that

non-human animals were capable of culture. When the question was initially asked in each

group, I prompted participants to indicate using Zoom reactions whether they believed "Yes,

animals are capable of culture" (indicated with a green checkmark) or "No, animals are not

capable of culture" (indicated with a red X). We hoped by asking participants to use Zoom to

indicate at the same time, rather than waiting for answers verbally, that participants would be

more likely to share their honest opinion rather than just agreeing with whoever spoke first. Out

of the 38 participants across 12 groups, almost all participants indicated "yes," that they believe

non-human animals were capable of culture ($n = 34$). Out of the four participants who indicated

"no," three were in the same group. This did not align with my initial prediction that there may

be more variation in perceptions of whether or not animals had culture.

With probing, for the most part, most animals discussed were considered to have or be

capable of having culture, regardless of type or category (e.g., mammals v. insects). For

example, when asked if only some participants were capable of culture, one participant said:

No, because I think even ants, you know, you see them go in packs and they're working

together to achieve a goal and certain things. So, it's learned how to live life and what

their traditions are, and how they build housing or get food, things like that. So here we

are talking about a whale, which is such a strong, you know, physical animal, and then

there's a little tiny ant they still have [culture] even though they're so drastically different

in the animal spectrum of things, they still have their own traditions and things.

On the other hand, a smaller group of participants were more adamant about animals not

being capable of having culture at all. Some noted this inclination was because of a fundamental

difference between humans and animals. For example, when asked why they believed animals did not have culture replied:

> I said, no, just because I feel like culture is maybe specific to humans. I feel like it's something that's practiced over time. It's developed, it becomes routine, kind of like [another participant] was saying, a daily routine and, yeah, animals can do that too, but I feel like they lack the certain maybe human capacity in the brain that allows for that to be kind of like tradition and turn into culture. Like why it's important like an animal can't, I don't know, understand maybe why what they're doing is important.

Specific Animal Examples. After describing whether or not participants believed that non-human animals were capable of culture, we asked participants whether or not they believed all animals (e.g., mammals, insects, reptiles, birds, fish, etc.) were capable of having culture or if only specific animals or groups of animals have culture. Though initially participants had almost all indicated that they believed animals have culture, once we began probing them, their responses were more varied.

On the other hand, certain animals were always brought up as examples demonstrating that animals do *not* have culture, and some animals were used as examples both for and against the stance that animals have culture. I went through each of the animals brought up and categorized them into three categories: 1) Cultural, for those animal examples that were unanimously brought up as having culture, 2) Ambiguously Cultural, for those animal examples that some participants explicitly said had culture while others explicitly said they did not, and 3) Not Cultural, for those animal examples that were unanimously brought up as not having culture (Table 2).

When a specific animal was brought up by a participant, I often asked participants why they believed that that particular animal or behavior was an example of culture. During these discussions, participants would note attributes and behaviors that, in an academic sense, would likely fall into the categories of cognition and sentience. Participants talked about not only how animals behave for survival, but also the emotions the animals had while doing those behaviors. For example, many participants brought up the example of elephants carrying their dead pack members in a procession like manner and labeled this behavior as grief. Additionally, when asked specifically about capacity for language and emotion, most participants believed that animals did have most of the emotions and language abilities of humans and potentially have their own emotions that humans do not have. These conversations suggested to me that participants seem to be conflating capacity for culture with other higher level cognitive processes. On the other hand, participants may use anthropomorphism in order to justify culture by seeing patterns similar to human behavior and classifying them as culture due to the similarity to human behaviors. If this is the case, it might mean that lay people believe that animals could have culture without having higher level cognition but would just rely on other, more specific types of behaviors (e.g., being social, showing certain emotions, behaviors that mirror humans).

In addition, after analyzing the animals discussed, my initial predictions surrounding rankings of animal categories were not completely supported in the responses. When looking at the animals described as having (or not having) culture, a few specific patterns emerged.

Social Animals. The first theme that emerged within the animals mentioned was animals that were deemed to have a social structure. This categorization seemed to transcend biological animal categorizations (e.g., mammals, insects, reptiles, fish, birds, etc). Participants noted that animals that are known to live, socialize, and work together are prime examples of animals

depicting culture. Specifically, almost every group brought up bees and ants within this category. Other examples included packs of wolves or wild dogs, schools of fish, pods of whales, and flocks of birds.

  Animals With Short Lives. Another commonly brought up theme is animals that participants perceived to have particularly short lives. For example, fruit flies, bugs, or other small bugs. In most cases, individuals believed that if there were any animals *not capable* of culture, it would be animals with short lives. Participants cited not enough time to pass culture across generations, not enough cognitive ability, and poor memory as specific reasons they believed animals with particularly short lives may be less likely to be able to have culture.

  Animals That Interact with Humans. Another category that emerged, but with more ambiguity across groups, were animals who have interactions with humans, for example pets, service animals, or animals in largely urban settings that see and/or interact with humans regularly. While some participants maintained that they believe all animals are capable of culture, others were more unsure if behaviors can be considered culture if they are created by another species (i.e., Can my dog have culture if he is just doing what I tell him to do?) Some participants believed that pets would be an example of cultures and subcultures. For example, there may be a broader "dog culture" that dogs in a specific area have, but then dogs have sub-cultures within their own homes (i.e., my dogs would have a subculture separate from my neighbor's dogs, etc.).

  Although participants' views of animal culture did not match my initial expectations, I was able to utilize the animals as well as the specific examples of animals exhibiting culture brought up within the groups to develop the stimuli for Study 2.

Individual Differences and Beliefs About Animals

The last section of our focus group interview asked participants to reflect on their personal, cultural, and religious backgrounds and specifically whether they believed this may have impacted their views about animals in any capacity. To ensure participants understood this more nuanced question, I gave an example of a Jewish person who has food restrictions based on specific religious beliefs surrounding animals (i.e., keeping Kosher: no pork, shellfish, or meat and dairy items together). Based on this question, a few sub themes emerged of what experiences from their own lives were believed to influence their perceptions about animals.

Personal Experiences with Animals. One commonly discussed experience that participants believed impacted their views of animals was personal, direct experiences. Many participants brought up their own pets, pets of their family members or close friends, or experiences with farm animals. These conversations led participants to compare differences in how they interacted with animals compared to others in the group. For example, some noted keeping animals in their home, letting them sleep on the bed, while others mentioned keeping their animals outdoors. Some participants attributed these differences to their family's own practices while others noted specific cultures that seem to have different pet-related practices. Additionally, participants discussed many different animals that they had personal experiences with, including, but not limited to, fish, dogs, cats, chickens, deer, cockroaches, rabbits, bears, ducks, and livestock. Many participants noted they believed the way that they consider animals now was highly dependent on the exposure they had to animals, namely pets, throughout their lives.

Cultural Beliefs About Animals. During these conversations, participants brought up examples of cultural differences in beliefs about animals. Some participants discussed their own

personal cultural beliefs and experiences while others noted examples of culture that they have seen as an outsider. For example, one focus group session talked about cultural differences in breed standards for dogs where in the United States people tend to dock the tails of schnauzer dogs as the breed standard for showing the dog, whereas in Germany docking the tails is considered taboo. Additionally, many participants brought up throughout the focus groups was the belief that certain animals are symbolic in particular cultures. For example, Chinese Zodiac animals, the use of animals in fables to represent particular personality traits (i.e., a sly fox, an evil snake), seeing certain animals as being bad luck (i.e., crows in Korea) or good luck (i.e., elephants in the Philippines), and seeing certain animals as representing a lost loved one (i.e., giant moths in Hawai'i).

Religious Beliefs About Animals. In addition to culture more broadly, participants often brought up explicit religious beliefs surrounding animals. In particular, multiple participants cited Catholicism, Islam, and Native Hawaiian religious beliefs as being particularly impactful for their beliefs about animals. For Catholicism, participants noted animals that were often used as symbols for good or pure (e.g., lamb, dove) and for bad or evil (e.g., snakes, goats). Additionally, these associations seem to stick with a person even when they no longer belong to that religious group. For example, one participant said:

> *I grew up Catholic and goats kind of freak me out a lot, because they were highly associated with the devil. And so, I'm not Catholic anymore, but now, even when I see a goat, I'm like, I'll just look the other way.*

For Islam, participants noted rules surrounding animals that are considered to be dirty and should not be touched or eaten. Particularly relevant for this sample, the Native Hawaiian religious beliefs discussed were *'Aumakua*, or personal family deities, that take the shape of

animals (e.g., *Moʻo*, or lizards; Brown, 2022). Native Hawaiian participants noted these beliefs led them to treat animals with high levels of respect and consider some animals to be reincarnated versions of humans or forms of Hawaiian Gods. For example, one participant noted:

> *My family's Hawaiian, and so we, I was always kind of raised with, when a person passes, their kind of spirit takes on a form of, most likely, an animal. It's called an ʻAumakua. And so, that's kind of how I've always seen animals … as kind of being like reincarnated people.*

Quantitative Data

In addition to the qualitative data, I collected quantitative data examining participants' beliefs surrounding animals' abilities as well as their personal demographics. I conducted exploratory analyses on the potential relationship between cultural beliefs collected in the Qualtrics survey (i.e., belief in reincarnation, religious diets, use of animals in society, etc.) and whether or not an individual believes that animals are capable of higher cognition, sentience, and culture. These results are exploratory in nature and will be considered further with a larger sample and adequate statistical power in Study 2.

Religiosity and Beliefs About Animal Cognition. To look at the relationship between religious factors and the Into the Animal Mind Survey, I conducted two separate independent samples t-tests with the independent variables of religious group identification (i.e., whether or not someone identified as religious versus not religious; ($t(36) = .78$, $p = .44$, $d = 0.28$) and Christian versus non-Christian identification ($t(36) = -1.23$, $p = .23$, $d = -0.41$), neither of which were significant. Additionally, I ran a regression analysis with a continuous measure of belief in reincarnation as an independent variable and the mean scores of the Into the Animal Mind Survey as the dependent variable, which was also not significant ($b = .22$, $p = .28$). Although

none of these analyses were statistically significant, these measures are reexamined with a larger sample in Study 2.

      Experience With Animals and Beliefs About Animal Cognition. To investigate personal experiences with animals, I measured whether or not individuals have had pets. I ran an independent sample t-test with current pet ownership as the independent variable and the into the animal mind survey as the dependent variable, which showed a marginal effect ($t(35) = 1.81$, $p = .08$, $d = 0.67$). Specifically, participants who currently owned pets showed higher belief in animal cognition and sentience as measured by the Into the Animal Mind survey. Additionally, I asked participants what they perceived their knowledge of wildlife to be. I then conducted a regression analysis with wildlife knowledge as the independent variable and into the animal mind survey as the dependent variable which was also not significant ($b = -.14$, $p = .63$). Finally, I asked participants whether or not they had been to a zoo or aquarium within the last year (Yes or No) and completed an independent samples t-test looking at the relationship between zoo/aquarium attendance and into the animal mind survey results ($t(36) = .49$, $p = .63$, $d = .16$). Although all of the exploratory analyses showed non-significant results, these relationships will be reexamined in Study 2 with a larger sample size.

Discussion

Summary of Results

      Results from Study 1 suggest that individuals may be likely to believe that animals are capable of culture, even without being primed to think so. While participants in this study did generally lean towards animals being capable of culture, this did not necessarily address why the animal–culture debate has persisted in many fields (de Waal, 2003). When asked explicitly, many participants felt their own personal, cultural, and religious upbringings impacted the way

that they think about and interact with animals. These results show that participants may be self-aware of how their religious and cultural beliefs may impact the way they think about animals, which has been previously studied within psychology (Brown, 2016; Ross et al., 2003; Waxman et al., 2014). Perhaps there are other factors that, depending on the context, may influence an individual's beliefs about animals. Study 2 continues this conversation by looking at specific primes or contextual factors that may influence whether or not individuals believe that animals have culture.

Limitations

As mentioned throughout the quantitative analysis, one major limitation is the sample size. Although the sample size for Study 1 is in line with standard focus group studies, this amount likely does not give us enough power to find and discuss effects from the quantitative analyses. While I did conduct exploratory analyses, the results were all non-significant, which may be due at least in part to lack of power due to a low sample size.

Another limitation came from the content of the interview. Initially when planning the questions, I believed it would be important to first discuss culture, so that participants would be on the same page for what "culture" means as we continued the discussion. While this may have been helpful to get onto the same page in the beginning, it may also have acted as a sort of prime, leading participants to be more likely to say animals are capable of culture in the subsequent discussions. While this is something to take into consideration, I believe that discussing culture gave us valuable insight and added to our understanding of how the lay person thinks about culture and how that relates to the animal–culture debate.

With any focus group discussion, there is the concern for response bias from the participants. To attempt to combat this, I let participants know initially that there was no right or

wrong answer to any of the interview questions and that I hoped they would share their honest opinions rather than what they thought we wanted to hear. I also requested that participants be respectful of the viewpoints of others in the discussion even if they did not agree with what other participants were saying.

Another limitation is that the interview was conducted over Zoom rather than a traditional, in-person study. Conducting the study virtually led to more technological issues (i.e., internet cutting out, problems connecting to the Zoom room, etc.), but I attempted to limit these by piloting the Zoom session with research assistants prior to running the actual interviews. Although Zoom meetings can be challenging for group discussions, by keeping the numbers small in each group and requesting cameras remain on during the duration of the study, participants hopefully felt encouraged to speak freely. To encourage participation, when asking initial questions that had a yes or no component (e.g., "Do you think animals are capable of culture?"), I asked participants to react using Zoom reaction buttons before starting the open-ended discussion for the given question. Between this method and the questions, themselves, every participant contributed actively to the conversation in some way. Additionally, by running this study online as opposed to in-person, I hope I was able to reach a wider audience for participation, as coming to campus during COVID-19 may have otherwise been a barrier to participation.

Additionally, due to the correlational nature of Study 1, I am unable to claim causation for any potential findings from the study. Rather, this study acts as an exploration for the potential relationship between cultural worldviews and belief in animal culture, which I will dissect further with my quasi-experimental design in Study 2.

Study 2

In Study 1, we found most participants, without any primed context, believed that nearly all animals are capable of culture, sentience, and higher-level cognition. Although the responses seemed almost unanimous within the focus group interview context, there seemed to be more nuances about when and why the belief persisted. For example, when participants were asked if animals were capable (broadly) of having culture, most said yes. But when asked about specific animal examples and categories, the initial unanimity waivered. This led me to believe that there may be specific mechanisms that impact people's beliefs surrounding animals. Specifically, what may make individuals more or less likely to perceive that animals are capable of culture? Because Study 1 showed a stronger perception in animal culture than initially expected, and to guard against a ceiling effect, Study 2 aimed to examine a factor that may *weaken* perceptions of animal culture.

Based on the conversations with participants regarding their cultural and religious beliefs and the known separation of humans and animals in some religions (e.g., in Christianity, some believing animals do not have souls or will not go to Heaven; Lawrence, 1995), I hoped to specifically examine the role of religion in animal beliefs. I sought to investigate what may impact beliefs about animals by conducting a quasi-experimental study examining how personal beliefs and environments could impact views about animals.

 I tested whether a science versus a religious mindset of a participant may influence perceptions of the culture of animals (versus humans), depending on whether or not they are religious. For example, if religion is more salient, will participants be more inclined to think about religious beliefs surrounding animals and therefore be more likely to perceive animals as separate from humans? Additionally, does this relationship differ depending on the religious

identity of the perceiver? Previous research has shown that religious participants tend to consistently be impacted by both implicit and explicit religious primes, while non-religious participants may or may not be impacted (Shariff et al., 2016). I also conducted exploratory analyses for other personal beliefs such as belief in evolution, belief in reincarnation, and morality views of nature.

To operationalize 'mindset', I used being within a religious versus science environment as an explicit way of having participants think about religion versus science. Since I was unable to bring participants physically into these spaces, I utilized episodic simulation, or asking participants to imagine themselves within these spaces (Gaesser & Cikara, 2020; Vollberg et al., 2021). Specifically, participants were asked to imagine themselves in a science (i.e., science museum) v. religious (i.e., a church, temple, etc.) setting and write about it for 3 minutes. This also allowed participants to think about religion versus science in a way that is meaningful to them (rather than asking them to consider religion and science broadly or one specific religious or science belief). Additionally, this prime has aspects that are explicit and implicit. The prime itself is explicit (i.e., participants are being asked to write about one of the variables of interest: religious versus science setting), but the prime likely has implicit effects (e.g., the connection to animals).

Although the prime itself is novel, it is building upon previous literature surrounding religious and scientific primes that suggest these types of primes do impact the way that religious and non-religious individuals view the world around them (Cavrak & Kleider-Offutt, 2015). Additionally, although these types of primes have not been used to measure beliefs about animals specifically, many religious groups do have beliefs and scriptures referencing animals as below humans (Hui & Coleman, 2012; Jegatheesan, 2015; Lawrence, 1995).

Priming participants to think about science has also been used within psychology and can impact individuals in realms similar to what has been shown with religion primes (e.g., morality judgements; Ma-Kellams & Blascovich, 2013). Science is often conflated with the secular when considering the opposite of religion and may also impact an individual's beliefs and behaviors (Galen, 2018). Thus, science makes an ideal control condition to examine potential effects of a novel religion prime.

This study had two main hypotheses:

H1: Participants will be *more* likely to perceive that animals have culture, and that they have *higher* cognition and sentience in the science prime as compared to the religion prime.

H2: There will be a Prime x Religiosity interaction such that the effect of the religion (vs. science) prime on perceptions of animal culture will be *stronger* for religious participants than non-religious participants.

Furthermore, I explored whether this tendency could be impacted by cultural worldviews such as belief in reincarnation, creationism, and evolution, and beliefs surrounding the domination of humans over nature and animals. Because there are cultural differences in individuals' perceptions of animals more broadly, these same differences may extend to the willingness to endorse animal culture specifically. Depending on the specific cultural belief, there is reason to predict that the prime could be more or less impactful.

Method

Design and Participants

Study 2 utilized 2 (Prime: Science vs. Religion) X 2 (Religiosity: Religious vs. Non-religious) X 2 (Images: Animal vs. Human) mixed design with repeated measures on the last

factor. The main dependent variable was continuous ratings of culture, and ratings on the animal images were compared to human images as a within-subjects factor in all key analyses.

I conducted an *a priori* Power Analysis using SPSS for a two-way repeated measures ANOVA in order to estimate my necessary sample size. Because I included the Into the Animal Mind survey in both Studies 1 and 2, I based estimates for power analysis on results from Callahan and Colleagues (2021) in which they found a large effect size of $\eta^2 = .23$. With a significance criterion of $\alpha = .05$ and power $= .80$, the minimum sample size needed with this effect size is $N = 151$. I planned to increase this sample size to account for the mixed methods nature of my planned analysis and to try for an even number of religious and non-religious participants in each condition.

In total, I collected 240 responses after utilizing the University of Hawaiʻi at Mānoa SONA subject pool. The survey was posted in two simultaneous waves: one for religious participants and one for non-religious participants. This ensured that we had an even number of individuals who identified as religious and non-religious, allowing us to use religiosity as a factor in the analysis. Participants received course credit for their participation in the study. After giving informed consent, participants completed the online task and were credited automatically through the participant pool system. Of those 240 responses, 33 were excluded for not completing the study, either before or after consent, or for duplicate participant IDs. The final sample included 207 participants who fully completed the prime and main measures of interest.

Half of the sample reported being religious (50.2%). Of the religious participants, a majority reported belonging to a Christian denomination (e.g., Catholicism, Protestantism, Orthodox, etc.; See Table 1) The participant gender breakdown was 79.7% Women, 15.9% Men, 1.45% Non-binary or another gender identity not listed, and 2.99% declined to answer. The

political identity breakdown was 53.6% Democrat, 12.1% Republican, 25.1% Independent, 5.3%

Another political party not listed, and 3.86% declined to answer. A majority of participants

identified as Asian, Caucasian, or Mixed Race (See Table 1 for full Race and Ethnicity

Breakdown). All participants were between the ages of 17 and 44 (M = 20).

Procedure

Participants were first asked to complete either a science or religion writing prompt. The

science prime was completed by 101 participants, and the religion prime was completed by 106

participants. The order of the prime was randomized between participants, and the primes were

evenly presented between religious and non-religious participants. Although the specific primes I

used are novel, they were adapted based on different primes that are used widely in the social

psychology and psychology of religion literature. For example, primes exposing participants to

religious symbols (Cavrak & Kleider-Offutt, 2015), asking them to imagine themselves in a

specific time or place (Gaesser & Cikara, 2020; Vollberg et al., 2021), and being asked to write

about specific scenarios involving things they may or may not have experienced (Rosenblatt et

al., 1989) have been shown to impact the way individuals see and judge others in the world

around them. Participants completed one of the following primes, which were randomized

evenly through Qualtrics:

Please take the next 3 minutes to write about the following:

Religion prime: Imagine you are at a place of worship (e.g., a church, synagogue,

mosque, temple, shrine, Heiau). What does your environment look like? What

objects do you see at the place of worship? Do you hear any sounds or smell

anything? If there are other people in your imagined environment, what are they

doing?

Science prime: Imagine you are at a science museum (e.g., a natural science museum, a natural history museum, a planetarium). What does your environment look like? What objects do you see at the museum? Do you hear any sounds or smell anything? If there are other people in your imagined environment, what are they doing?

After writing for three minutes, participants answered an open response question defining what their idea of culture is. Individuals then viewed 80 images: 40 depicting humans participating in cultural behavior and 40 depicting animals participating in similar cultural behaviors. The order of all 80 images were randomized to address any order effect. Animal images were selected from previous animal culture and animal behavior research papers and included simplified descriptions from the original paper explaining the behavior (e.g., Whiten et al., 2021). Each animal image was matched with a human equivalent from Google Images with a mirrored description from the animal image counterpart (see Appendix C). Animal images were focused on the animals that were brought up most often within the Study 1 focus group interview sessions to ensure that animals were examples of what participants may think of when asked about animal culture more broadly. Images were selected based on specific animals and animal examples brought up within the Study 1 focus groups and human–animal equivalency (i.e., Are the human and animal matches considered to be doing similar things?). Images were piloted by research assistants and unclear images and captions were replaced or edited prior to running. All participants viewed all 80 images so that they were able to respond to both the human and animal images. Participants were introduced to the topic by reading the following prompt:

Scientists currently disagree on what culture is and whether or not animals have culture. We are interested in your opinion on whether or not each of the following images depict an example of culture. There are no right or wrong answers. You should go with your gut response rather than deliberating for a long time over each item.

Then, for each image, participants were asked on a scale of 1–7, whether or not they believed each image is an example of culture (Animal images Cronbach's alpha = .97; Human images Cronbach's alpha = .96; "1 = Definitely not", "7 = Definitely yes"). Additionally, participants answered survey questions related to ratings of animal cognition and behavior, measures of cultural worldview, and demographic questions (see Appendix D). I also included a qualitative response question to probe what they were thinking about during the task that acted as both an attention check and the explicit reasoning for their decisions. Prior to data collection, research assistants piloted this task in order to determine the appropriate length to prevent participant fatigue.

Measures

In addition to the ratings of each image's depiction of culture, participants were asked to complete survey questions relating to animal cognition, measures of cultural worldviews, and personal demographics.

Animal Cognition. To assess beliefs about animals' cognitive abilities, participants completed the "Into the Animal Mind Survey," which asked whether they believe animals have the capacity for different emotional, behavioral, and cognitive abilities (e.g., problem-solving, complex feelings, understanding others; 0 = "Not at all capable," 10 = "Extremely capable;" a higher score indicates a stronger belief in the cognitive capabilities of animals; Cronbach's alpha = .96; Appendix D1; Callahan et al., 2021).

Human Relationship with Nature. To measure beliefs about human dominance over nature, participants completed the "New Environmental Paradigm". In this measure, participants were asked questions assessing how they believe humans should interact with the world around them (e.g., mankind ruling over nature, humans modifying nature, etc.; 1 = "Strongly disagree;" 7 = "Strongly agree;" low values indicate a belief that humans have the right to use nature according to their needs; Cronbach's alpha = .74; Appendix D2 ; Dunlap & Van Liere, 1978)

Human Use of Animals. To measure beliefs about how animals should be used within society, participants completed the "Belief about the use of animals in society" survey, answering questions assessing beliefs about how animals should or should not be treated by humans (e.g., eating, animal testing, etc.; 1 = "Disagree very strongly", 7 = "Agree very strongly", high values indicate a stronger belief that animals can be used to better human life; Cronbach's alpha = .73; Appendix D3; Phillips & McCulloch, 2005).

Demographics. Demographic questions, including age, gender, ethnic and racial background, religious affiliation, and socioeconomic status, were included for participants during the survey. Additionally, I included questions about animal experiences (e.g., pets, experiences with zoos) as well as personal beliefs that I expected may be related to beliefs about animals, namely belief in reincarnation, belief in creationism, and belief in evolution (Appendix D4; Callahan et al., 2021).

Results

Correlations Between Key Measures

I first wanted to analyze the correlation between my key measures of animal cognition, a previously established measure, and animal culture, my novel measure. I ran a correlation analysis with the belief in animal cognition, ratings of human images, ratings of animal images,

and the difference score between human and animal images. First, belief in animal cognition was positively correlated with ratings of animal culture images ($r(200) = .34$, $p < .01$), meaning the higher participants endorsed believing in animal cognition, the higher they rated images of animals for culture. Next, belief in animal cognition was positively correlated with ratings of human culture images ($r(200) = .25$, $p < .01$), meaning the more participants endorsed believing in animal cognition, the higher they rated images of humans for culture. Finally, belief in animal cognition was negatively correlated with the image difference score (human image - animal image) culture ratings ($r(200) = -.20$, $p < .01$), meaning the more that participants endorsed believing in animal cognition, the lower their image difference score was, or the closer they rated animals to humans on culture.

Main Analyses

Effect of Prime and Religiosity on Ratings of Culture. To examine my main hypotheses on the effect of the prime, participant religiosity, and image type on beliefs about whether or not animals (compared to humans) have culture, I conducted a 2 (Prime: Religion vs. Science) X 2 (Religiosity: Religious vs. Non-religious) X 2 (Image: Animal vs. Human) 3-way Mixed ANOVA with within-subjects on the last factor. My main dependent variable of interest was perceptions of culture (see Figure 1a and 1b).

For the main effect of image type, results showed a significant difference in how images were being rated ($F(1, 202) = 6.99$, $p = .01$, $\eta^2 = .03$) such that human images ($M = 5.08$, $SD = 0.93$) were more highly rated as depicting culture than animal images ($M = 4.90$, $SD = 1.29$). These results indicate that while individuals do seem to rate animal images as having culture in general given that the mean is above the scale midpoint, there is a significant difference in the extent to which people perceive culture between humans and animals.

For the main effect of condition, results showed a significant difference in how participants were rating images ($F(1, 202) = 6.71$, $p = .01$, $\eta^2 = .03$) such that participants in the science condition rated images as higher on culture ($M = 5.17$, $SD = 0.97$) than participants in the religion condition ($M = 4.82$, $SD = 1.00$). This suggests that in general, the religion prime may be lowering perceptions of culture compared to the science prime. These findings were in line with my initial hypothesis (H1).

The main effect of participant's religiosity (i.e., whether they identified as religious or not religious) was not statistically significant, meaning there was no difference in how participants were rating images overall depending on whether or not they were religious ($F(1, 202) = 1.03$, $p = .31$, $\eta^2 < .01$).

Importantly, results showed a marginally significant 3-way interaction for Image X Condition X Religiosity ($F(1, 202) = 3.75$, $p = .05$, $\eta^2 = .02$). I probed the 3-way interaction by examining the 2-way interactions of religiosity and condition split by image type[5].

As expected, there was no significant 2-way interaction between religiosity and condition for the human images ($F(1, 202) = .86$, $p = .35$, $\eta^2 < .01$; Fig. 1a). Importantly, for the animal images, there was a significant 2-way interaction between religiosity and condition ($F(1, 202) = 4.93$, $p = .03$, $\eta^2 = .02$). Among religious participants, there was a significant simple main effect of the prime such that religious participants in the science condition rated animal images higher on culture ($M = 5.58$, $SD = 5.63$) than in the religion condition ($M = 4.634$, $SD = 1.60$), which I confirmed with a Bonferroni post-hoc test ($t(102) = 3.40$, $p < .01$; Fig. 1b). For non-religious participants, there was no significant interaction between religiosity and condition ($t(100) = .74$, $p = 1$). In addition, in the science prime condition, there was a significant simple main effect of

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[5] For a visualization of the interaction broken down by religiosity, see Figures 2a and 2b.

participant religiosity such that non-religious participants rated animal images lower on culture ($M = 4.80$, $SD = 1.07$) than the religious participants ($M = 5.581$, $SD = 1.21$), which I confirmed with a Bonferroni post-hoc test ($t(99) = -3.19$, $p = .01$; Fig. 1b). In the religion prime condition, there was not a significant interaction between participant religiosity and image type ($t(103) = -.08$, $p = 1$). These findings suggest that the interactive effect of the prime and image type seem to be particularly impactful for evaluating animal examples and that the belief in animal culture may be impacted by a combination of individual religiosity and environment. Specifically, results suggest that when religious participants are exposed to the science prime, their perception of animal culture is higher than when exposed to the religion prime. These findings are in line with my hypothesis (H2) that the effect of the primes would be stronger for religious as compared to non-religious participants. Both primes appear to be stronger for religious participants as compared to the non-religious participants when considering the Condition X Image Type interactions.

Effect of Prime and Religiosity on Belief in Animal Cognition. I conducted a 2 (Prime: Religion vs. Science) X 2 (Religiosity: Religious vs. Non-religious) between-subjects ANOVA looking at belief in animal cognition and sentience as the dependent variable. The main effect of religiosity ($F(1,198) < .00$, $p = .98$, $\eta^2 < .00$), the main effect of condition ($F(1, 198) = 1.24$, $p = .23$, $\eta^2 < .00$), and the interaction of religiosity X condition ($F(1, 198) < .00$, $p = .95$, $\eta^2 < .00$) were all not statistically significant. This does not align with my initial hypothesis (H1) that participants in the religion prime would be less likely to endorse animal cognition and sentience. This may be due to participants in general being likely to endorse animal cognition ($M = 7.48$, $SD = 1.53$), and thus there may be a ceiling effect of the belief in animal cognition as they are already endorsing highly regardless of the prime. Future research could look into whether or not

a stronger prime would impact the belief in cognition as well as culture to confirm or disconfirm a ceiling effect.

Exploratory Analyses

In addition to my main analyses of interest, I conducted exploratory analyses utilizing different cultural and personal belief factors that might impact beliefs surrounding animals.

Into The Animal Mind. First, I conducted a 2 (Prime: Religion vs. Science) X 2 (Religiosity: Religious vs. Non-religious) between-subjects ANOVA with the mean scores of the Into the Animal Mind scale as the main dependent variable of interest. There were no significant main effects or interactions (all $ps > .26$).

Animal and Nature Beliefs. Next, I conducted a multiple regression analysis looking at the relationship between personal beliefs about animals and culture perception ratings. Specifically, I used a difference score of the image ratings (human images - animal images) for the dependent variable and used beliefs about animal morality, beliefs about human dominance of nature, and beliefs about animal sentience and cognition as predictor variables. The overall regression model was significant ($F(3,195) = 3.85$, $p = .01$, $r^2 = .06$). However, only belief in animal cognition was a significant individual predictor of belief in animal culture ($b = -.14$, $p < .01$). A full summary of results, including non-significant predictors, can be found in Table 3a and a full correlation matrix can be found in Table 3b. These findings suggest that belief in animal cognition is negatively correlated with the mean difference between human image ratings and animal image ratings (Figure 3). Specifically, lower belief in animal cognition predicts human images as being rated higher than animal images. The higher participants rate animal cognition, the more likely animal images are rated as closer to, or in some cases higher than human images.

Specific Religious Beliefs. I conducted a multiple regression analysis to test if belief in reincarnation, belief in evolution, and belief in creationism predicted differences in image ratings, using the difference score of human image ratings - animal image rating. The overall regression model was not significant ($F(3, 196) = 1.93$, $p = .13$, $r^2 = .03$), suggesting that these particular religious beliefs may not predict belief in animal culture. A full summary of results, including non-significant predictors, can be found in Table 4a and a correlation matrix of measure can be found in Table 4b.

Additionally, I conducted a multiple regression analysis to test if belief in reincarnation, belief in evolution, and belief in creationism predicted belief in animal cognition using the mean of the Into The Animal Mind Survey. The model was not significant ($F(3,196) = 1.73$, $p = .16$, $r^2 = .03$), suggesting that these beliefs may not predict how strongly participants endorse belief in animal cognition. A summary of the results, including non-significant results, can be found in table 5.

Discussion

Summary of Findings

In line with Study 1, participants were often willing to endorse both a human and animal ability to exhibit culture, but Study 2 breaks down these findings a little more precisely. Study 2 investigated both individual characteristics and situational factors that may impact an individual's beliefs regarding animals.

First, Study 2 shows a positive correlation between belief in animal cognition and ratings of both animal and human images, but also shows a negative correlation in the mean difference score of human images - animal image ratings. Although it seems higher belief in animal cognition is positively correlated with both belief in animal and human culture, the negative

correlation with the difference score suggests that those who highly endorse belief in animal cognition may show less variation in how they are rating animal versus human images (i.e., belief in animal cognition may be related to willingness to endorse culture overall). Additionally, the correlation between belief in animal cognition and ratings of animal culture helps to build validity for my novel measure.

Results from Study 2 suggest that the interaction between the religiosity of the perceiver and exposure to religion versus science based environmental primes may impact the way that individuals view animals compared to humans, particularly when assessing whether animals are exhibiting culture. While there does not appear to be an interaction between image type (animal vs. human) and environmental exposure (religious vs. scientific) for non-religious perceivers, religious perceivers seem to depend on both what they are considering and their environment when considering what it means for something to be culture. Specifically, for religious participants, when viewing images of animals, ratings of culture are higher in the science prime as compared to the religion prime. These findings support my first hypothesis, as there is a main effect of condition (religious environment vs. science environment). Additionally, my second hypothesis is supported, as this relationship does seem to depend on an interaction between religiosity of the participant and the image type. These differences could be due to a few reasons. First, religious individuals, particularly undergraduates just coming to college from high school, may have had more exposure to their religion than to science in their everyday life. If this is the case, there may be a habituation effect where religious participants do not react as strongly to thinking about their church (which may be commonplace for them) as compared to when they are asked to think about science (which they may not have been asked to do as much previously). Additionally, this could be a form of frame switching for religious participants. Science and

religion are often framed as being at-odds with each other, and there are often negative stereotypes within academia about individuals who are both religious and are within science-based settings (e.g., academia; Rios & Roth, 2020; Rios et al., 2015; Sharp et al., 2022). Because of this, individuals who believe in both religion and science may feel they need to adapt to the setting they are in. If this is the case, the science prime may be more impactful to religious participants as they may be attempting to push aside their religious identity and overcompensate for the negative stereotypes associated with religion (namely Christianity) and science.

Contrary to my initial hypothesis, participants in the science condition did not rate belief in animal cognition higher in the science environment condition compared to the religion environment condition. This could be due to participants, no matter the condition, being willing to highly endorse animal cognition, so the prime did not make much of a difference (i.e., ceiling effect).

When considering specific religious beliefs that can directly relate to animals, for example belief in reincarnation, belief in evolution, and belief in creationism, exploratory analyses do not show evidence for these cultural worldviews predicting belief in animal cognition or culture. Additional research should be conducted to dissect what specific religion-based mechanisms may be responsible for the interaction.

Limitations

One limitation of this study is that my main dependent variable with corresponding stimuli has not been utilized in previous psychological studies. To help build support for this measure, I also included other, more widely used, measures of perceptions of animal sentience and cognition (Appendix D1 & D2). My novel dependent variable was correlated with previously used measures of animal perception, building validity for my measure. Future

research should replicate this study's findings utilizing other stimuli images or other participant samples to ensure replicability.

An additional limitation is that this study was run virtually via university participant pools. This limits us not only to convenience sampling, relying on who is available and willing to participate from the pool, but also risks that there will be distractions and other factors we cannot control while participants are taking the study. I included an attention and manipulation check at the end of the survey to ensure participants were paying attention during the writing task. Additionally, participants who did not complete our measures, the prime and the image ratings, were excluded from analysis. Future research may consider running this task in person or utilizing a synchronous online session so the researcher can ensure participants are paying complete attention to the task.

A final limitation to consider is generalizability, particularly in terms of religious affiliation, as most of our religious participants were Christian. Although there does seem to be evidence from this study that religious identity may impact beliefs surrounding animal culture, it is important to note that the majority of religious participants identified as Christian. Future research should seek out a more diverse set of religious affiliations to test for potential differences.

General Discussion

This project sought to explore how personal experiences and beliefs impact individuals' views about animals. Specifically, while researchers and lay people alike seem to perpetuate the debate of whether or not animals have culture, the question of why the debate is so widespread has been ignored in research.

Implications for Perceptions of Animal Culture

Study 1 gave participants the opportunity to discuss, in open-ended responses, what lay people think of as culture, how this translates into beliefs about animals, and what personal, cultural, and religious factors might underlie their beliefs. While initially it appeared that participants were almost unanimous in their beliefs about animals having culture, by examining their responses closer I was able to see the debate seems to be more contentious when discussing specific animal categories (e.g., mammals versus reptiles) and examples (e.g., elephants versus pet dogs). Additionally, participants were able to cite specific belief systems, specifically rooted in culture and religion, that they believed to be impactful in their personal views towards animals. These findings provide evidence of participants' awareness of the connection between culture and animals. This is situated with previous research surrounding cultural differences in beliefs and exposure to animals (Lawrence, 1995; Phillips & McCulloch, 2005; Ross et al., 2003; Sinclair & Phillips, 2017; Waxman et al., 2014). The results of Study 1 also allowed for more specification for the relevant stimuli and measures to be used for Study 2.

Cultural and Religious Differences in Animal Perceptions

Study 2 built upon Study 1 by examining the specific personal and environmental factors that might impact belief in animal cognition, sentience, and culture. By utilizing different animal example images for stimuli, Study 2 showed evidence for assumptions made in Study 1, namely that there are differences in perceptions of animal culture depending on the animal category, the specific animal itself, and behavior. This builds upon previous research surrounding perceptions of animals by adding culture into the mix of cognition, intelligence, emotion, and sentience (Callahan et al., 2021; Phillips and McCulloh, 2005). Including research on cultural perceptions of animals is important both because our cultural view reflect how we view the world around us broadly, but also because many cultural and religious groups do seem to have differences in how

they think about and are exposed to animals (Lawrence, 1995; Phillips & McCulloch, 2005; Ross et al., 2003; Sinclair & Phillips, 2017; Waxman et al., 2014). With recent worldwide conversations about the ethical treatment of animals (e.g., The 2022 Animal Welfare (Sentience) Bill in the United Kingdom; UK Parliament, 2022, see also: Wynne, 2013), considerations about how individuals perceive animals, and their abilities differently have real world implications.

Study 2 also showed that religion seems to play an important role in individuals' beliefs about animal culture, both in terms of the person's beliefs and the environment they are exposed to. Specifically, for religious individuals, priming with either religion or science seemed to impact how the participants perceive animals' capacity for culture. Although I hoped that the science condition would act as a control, without a completely neutral condition I am unable to say with certainty whether the science prime is *increasing* the religious participant's belief in animal culture or whether the religion prime is *decreasing* their belief in animal culture. For the religion side, previous literature suggests that religious doctrines may have certain connotations about animals (i.e., being lesser than humans) which could in turn lower the belief in animal culture compared to priming science. On the other hand, perhaps there is something about when religious individuals are considering science, which may not be as readily salient in their minds compared to their religious beliefs, they may be more impacted when primed.

Study 2 also allowed us to look at the layperson's connection between cognition and culture in animals. Specifically, higher belief in animal cognition predicted higher belief in culture overall for both humans and animals. On the other hand, while they did predict belief in animal culture, religious beliefs of the participant and having a religious versus science mindset did not impact the participant's views of whether or not animals broadly have higher level cognitive abilities. This could be that belief in cognition in animals is already high, so the

individual beliefs or prime did not impact the belief (i.e., ceiling effect). It could also mean that participants are relying on other, non-cognitive based mechanisms for deciding whether or not something is "cultural."

Mechanisms at Play

This study has begun to unpack the complexities of why the animal culture debate exists, but there seems to be more to examine, particularly when it comes to why these differences are occurring. Although many individuals commonly anthropomorphize when making thinking about animals (Horowitz & Bekoff, 2007), previous research has shown that religious or cultural groups that have higher exposure to natural environments show lower anthropomorphic tendencies (e.g., Menominee children in Ross et al., 2003). This is contrary to my findings in that our religious participants in scientific settings (a potential equivalence to exposure to nature in the Menominee sample) tended to rate the animal images as more similar to humans (i.e., *higher* on culture) as compared to more separated from humans (Ross et al., 2003). On the one hand, this may mean that anthropomorphic thought is not the mechanism by which religious participants are making their considerations. On the other hand, this may be a reflection of the participant demographics. Specifically, the religious participants I sampled were mainly Christian, while Ross and colleagues (2003) found their effects within Menominee individuals. Perhaps participants who are religious but also have higher cultural connections to nature (e.g., Native Hawaiian, Native American, other Indigenous groups; Brown, 2016; Ross et al., 2003) would respond to this prime differently than both Christian and non-religious participants.

Implications for Culture

Beyond implications for understanding lay perceptions of animal culture, these findings have implications for considering culture more broadly. While the debate of whether animals

actually do have culture remains unresolved (de Waal, 2003), it is clear that our own definitions of "culture" as well as our own unique background play into how we label something as cultural or not cultural. Although this study shows evidence for personal experiences working together to paint the way that we consider animals, it is likely also true that there remains disagreement over whether animals have culture due to differences in the basic definitions of culture itself and whether or not it includes animals (Laland & Hoppitt, 2003; Shweder, 1995; Whiten, 2021). Specifically, if individuals believe that culture is strictly a human ability and have a large separation in their minds about what is "human" and what is "animal," they may be less likely to endorse animal culture broadly. On the other hand, if an individual's initial definition of culture already includes animals or is broad enough to not exclude them, it may be easier for those participants to endorse animal culture. Researchers and lay people alike may struggle to ultimately decide on what is or is not culture when considering specific examples at least in part due to the lack of consensus on a singular definition of culture.

Future Research

While this study has begun to examine the topic of lay perceptions of animal culture both qualitatively and quantitatively, there are avenues for future research that should be considered. First, more diversity in demographics should be considered, particularly for religious diversity. While participants in Study 1 brought up non-Christian examples of religion and animals, a majority of the religious participants in both studies identified as Christian. This does not allow for generalization to other religious beliefs and practices. This is particularly important for religious groups that do not have as extreme polarization between humans and animals as Christianity does, for example Indigenous and nature-based religions (Brown, 2016; Ross et al., 2003) or religious groups that strongly endorse reincarnation (Hui & Coleman, 2012). Beyond

religious diversity, other areas of cultural diversity should be examined in future samples as previous literature has found East-West differences in ratings of animals on intelligence, cognition, and sentience (Nakajima et al., 2002, Phillips & McCulloh, 2005).

Additionally, this study could be expanded by utilizing a new set of animal stimuli to help examine the reliability and validity of the novel measure and prime. Specifically, it would be useful to create a stimuli set with both human and animal equivalences (as I did with Study 2) as well as equal numbers of cultural activities (e.g., food, activities) and animal types (e.g., mammals, birds, reptiles). This would allow for an exploratory factor analysis to examine differences in how participants are rating the images both in terms of what it means for something to be a cultural activity (across both human and animal images) and which specific animals are more cultural.

Finally, despite support for the religious vs. science environment prime impacting perception, the current study does not include a neutral control group to examine which way the prime is working (i.e., is the religion prime *decreasing* baseline perceptions of culture or is the science prime *increasing* baseline perceptions of animal culture?). Future research should consider utilizing a neutral prime to assess how this prime works more specifically (i.e., not scientific, religious, or relating to animals, for example, imagine your last trip to the grocery store). Continuing this line of work with follow up studies would allow for more support for the animal perception, religion, and cultural connection.

Conclusion

There is no question that human–animal interactions play a part in our lives in many ways. While we may not always be aware of it, our own personal beliefs and daily environmental factors may play an important role in the way that we think about animals. Specifically, this

project found evidence for a relationship between personal religiosity and religious versus science-based environments on the beliefs that animals are capable of culture. This research began to unpack why the animal–culture debate has persisted and what specific beliefs and mechanisms might be at play, confirming Franz de Waal's (2001) initial observation, that everyone wants to join the conversation about animal culture.

Tables

Table 1

Participant Demographics

Variable	N Study 1	N Study 2
	All Participants	
	38	207
Ethnicity (Multiple Select)[a]		
Chinese	6	34
Filipino	6	52
Asian Indian	1	0
Japanese	3	45
Korean	3	6
Vietnamese	0	5
Micronesian	1	1
Native Hawaiian	3	22
Samoan	0	4
Hispanic	2	33
Caucasian	6	87
African American or Black	4	12
Native American, Native Alaskan, or another Indigenous Group	1	8
Other Ethnicity Not Listed	3	20
Race (Select one)[b]		
Asian	9	64
Native Hawaiian or Pacific Islander	0	6

Hispanic or Latino/a/x	2	16
Caucasian	10	53
African American or Black	2	2
Native American, Native Alaskan, or another Indigenous Group	0	2
Mixed Race (2 or more categories from above)	15	57
Racial Group Not Listed	0	1

Religious Affiliation (Select one)[b]

Christian Protestant	4	35
Christian Catholic	8	60
Christian Orthodox	3	3
Jewish	0	2
Muslim	1	0
Buddhist	1	9
Agnostic	6	33
Atheist	4	32
Religion not listed (please specify)[c]	11	25

[a]Participants were allowed to select multiple options for the ethnicity question. For this reason, the total amount adds up to > my *n* of 207.

[b]This question was optional and not all participants disclosed their race and religious affiliation. All participants who were included in the sample did answer a religious versus not religious question in a prescreen facilitated through the UH Sona pool.

[c]Within the "Religion not listed" category, a majority of the text entries were other Christian denominations.

Table 2

Focus Group Animal Categorizations

Categorization	Specific Animals
Cultural	Ants, Bees, Horses, Zebra Doves, Microorganisms, Slugs, Coyotes, Whales, Rats, Frogs, Orcas, Sea Turtles, Elephants, Cicadas, Social/Group Animals, Lions, Caribou, Chinese Zodiac Animals, Foxes, Groundhogs, Peacocks, Cows, Wolves, Service Dogs, Lambs, Doves, Symbolic Animals, Squirrels, Chickens, Monkeys, Apes, Octopi, Tigers, Sea Otters, Penguins, Ravens, Bears, Sharks, Dolphins, Seals, Spiders
Ambiguously Cultural	Dogs (pets, strays, dogs not in a pack), Pigeons, Reptiles, Fish, Cats (pets, strays), Praying Mantis, Mosquitos, Crickets, Moths, Insects (broadly), House Pets/Domesticated Animals
Not Cultural	Flies, Leaf Bugs, Bugs with short lives, very small bugs, Gnats, Ameba, Worms, Goldfish

[a]Cultural animals were always noted as having culture when brought up in the discussions.

[b]Ambiguously Cultural animals were sometimes brought up as having culture and sometimes brought up as not having culture, depending on the specific discussion.

[c]Not Cultural animals were always noted as not having culture when brought up in discussions.

Table 3a

Multiple Regression with Personal Beliefs About Animals Predicting Perception of Human vs. Animal Culture

	Unstandardized b	Standard Error	t	p
Animal Morality	-.13	.10	-1.25	.21
Nature Dominance	.11	.10	1.11	.26
Animal Cognition	-.12	.05	-2.98	< .01

$R^2 = .06$

Table 3b

Correlations for Personal Beliefs about Animals and Perceptions of Human v. Animal Culture

Variable	1	2	3	4
1. Image Difference Score	—			
2. Animal Morality Belief	-.10	—		
3. Nature Dominance Belief	.07	-0.36***	—	
4. Belief in Animal Cognition	-.20**	-0.075	0.21**	—

* p < .05, ** p < .01, *** p < .001

Table 4a

Religious Beliefs and Animal Culture Multiple Regression

	Standardized *b*	Standard Error	t	p
Reincarnation	-.10	.06	-1.73	.08
Evolution	.04	.07	.61	.54
Creationism	-.07	.06	-1.22	.23

$R^2 = .03$

Table 4b

Correlation of Religious Beliefs and Animal Culture

Variable	1	2	3	4
1. Image Difference Score	—			
2. Reincarnation	-.11	—		
3. Evolution	.07	.30***	—	
4. Creationism	-.12	-.07	-.51***	—

* p < .05, ** p < .01, *** p < .001

Table 5

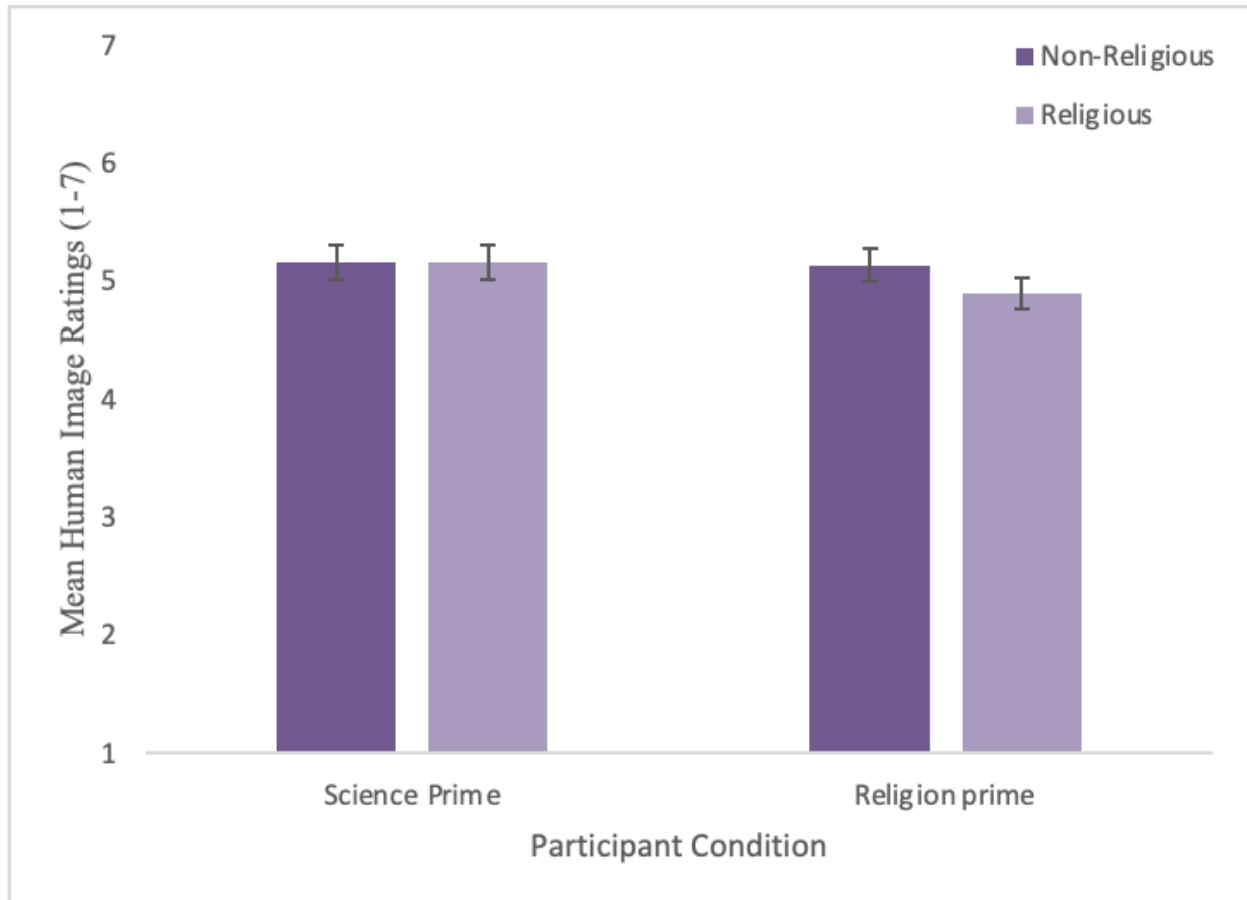*Religious Beliefs and Animal Cognition Multiple Regression*

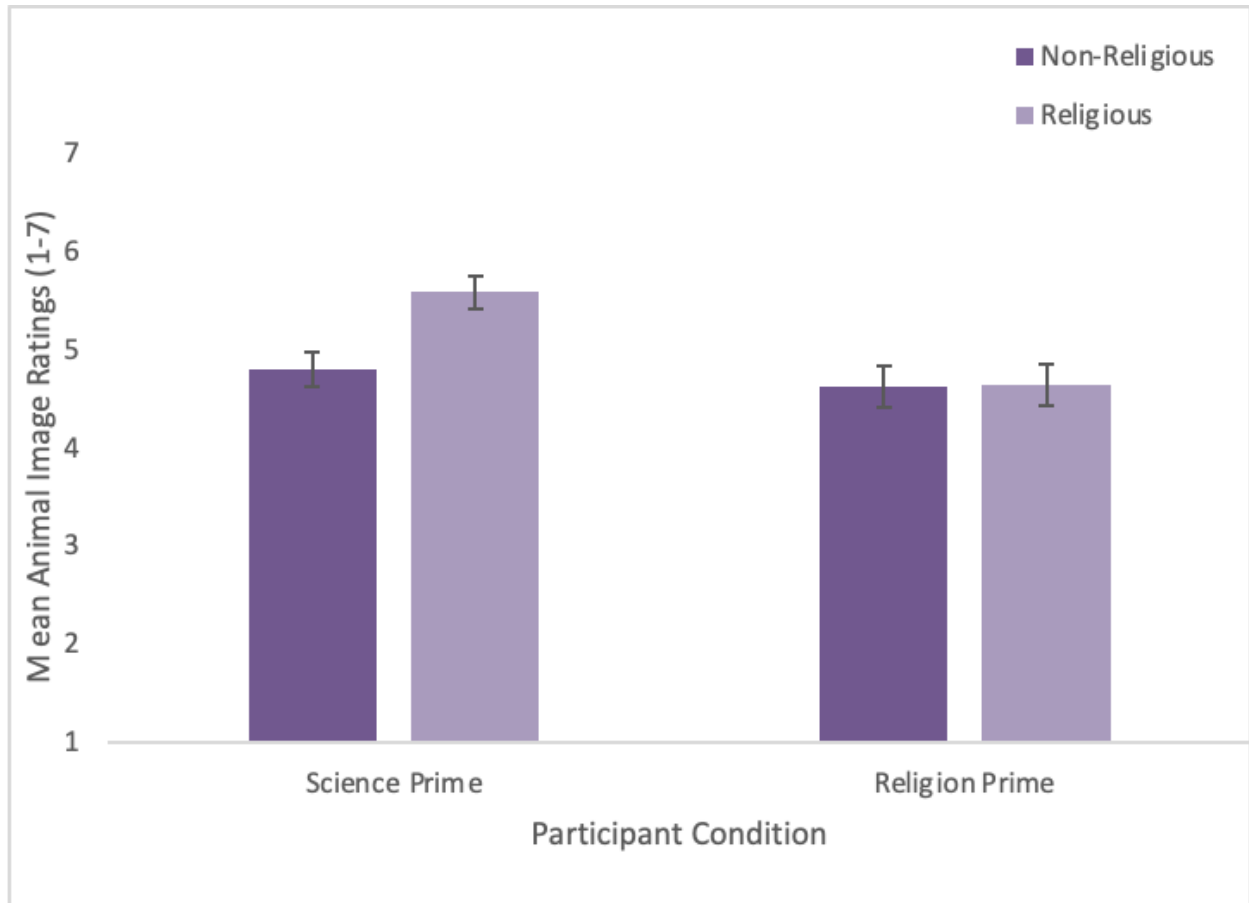|	Standardized *b*	Standard Error	t	p
Reincarnation	-.03	.09	.34	.71
Evolution	.21	.11	1.96	.05
Creationism	.14	.09	1.54	.12

$R^2 = .03$

Figures

Figure 1a

Study 2 Ratings of Culture for Human Images

Note. This figure shows the relationship between participant condition and ratings of human culture broken up by participant religiosity.
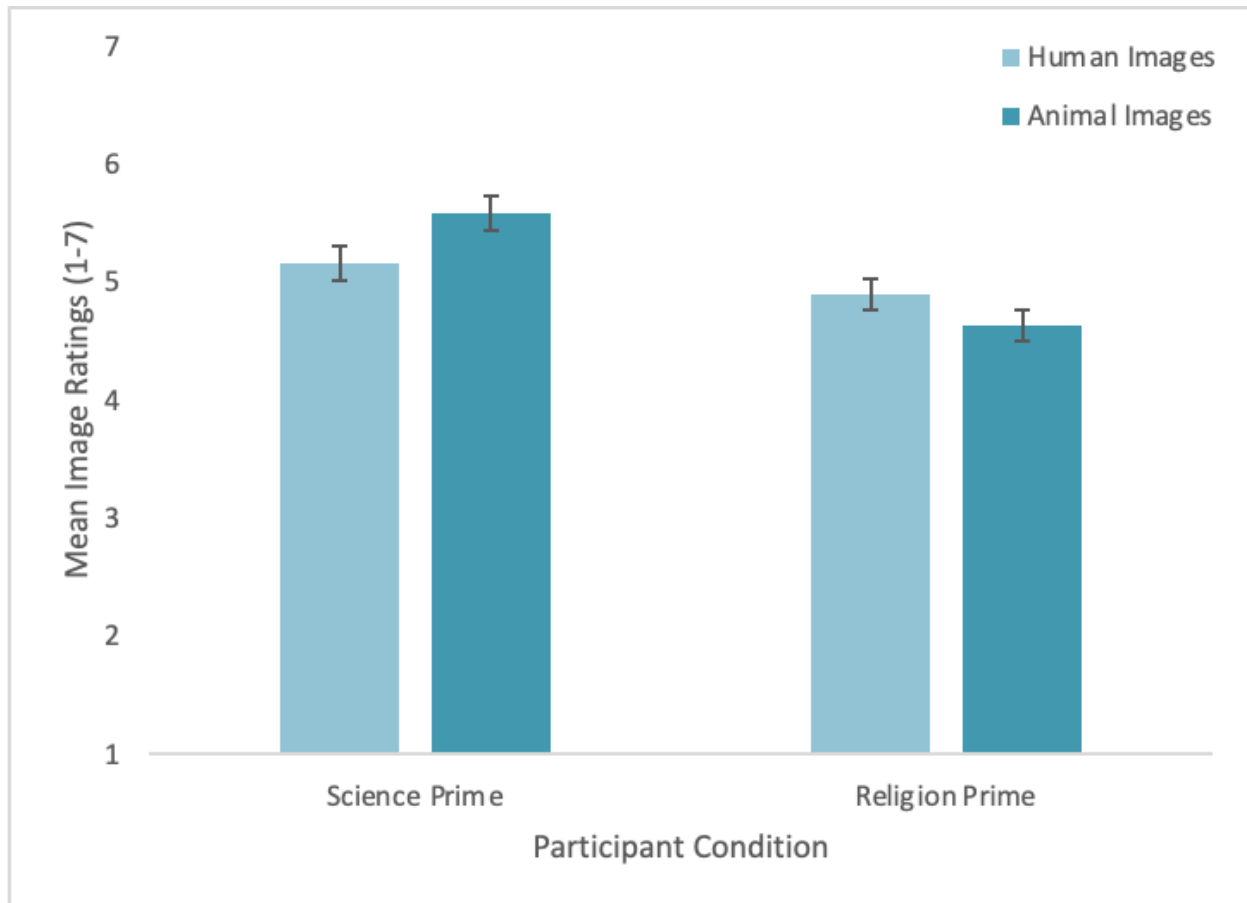
Figure 1b

Ratings of Culture for Animal Images

Note. This figure shows the relationship between participant condition and ratings of animal culture broken up by participant religiosity.
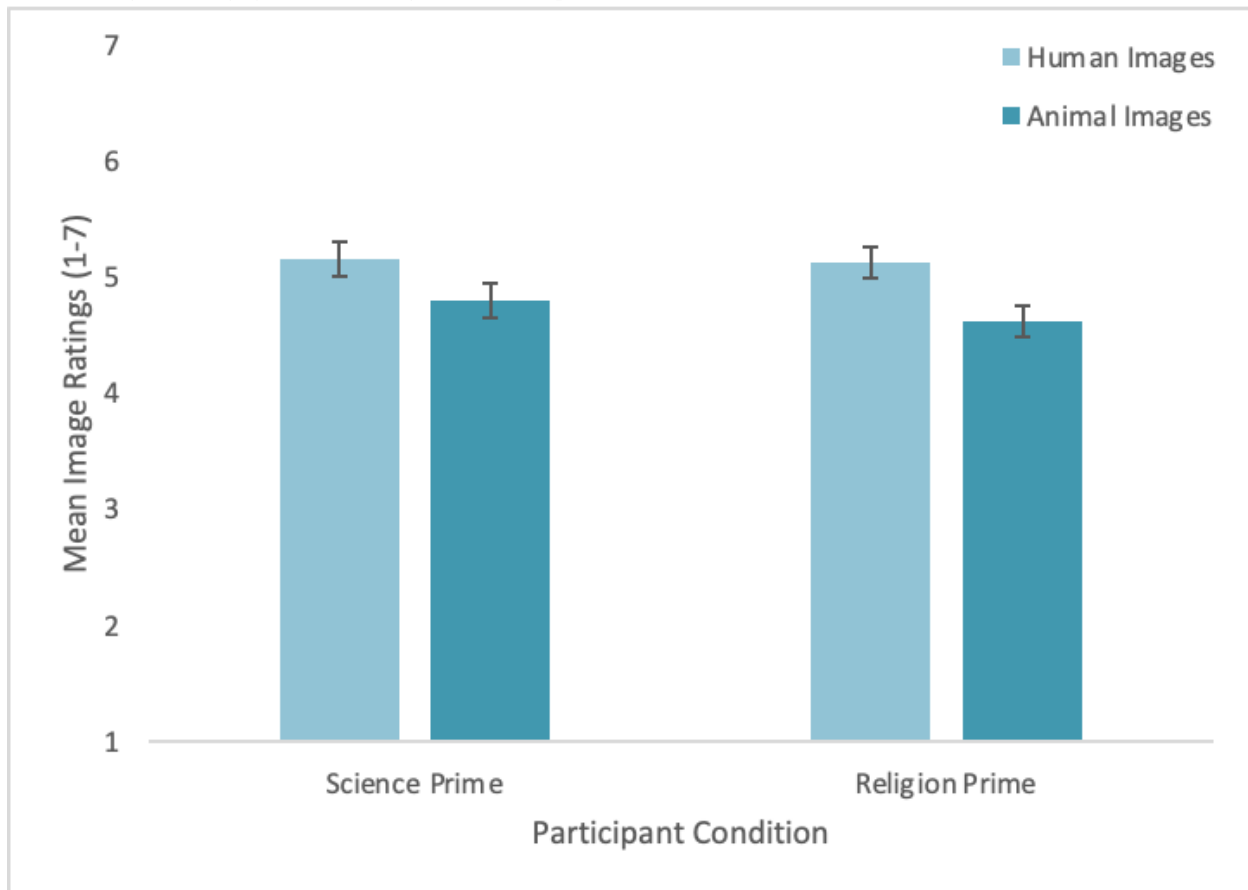
Figure 2a

Mean Culture Ratings for Religious Participants

Note. This figure shows the relationship of religious participant's condition on ratings of culture broken down by human and animal images.
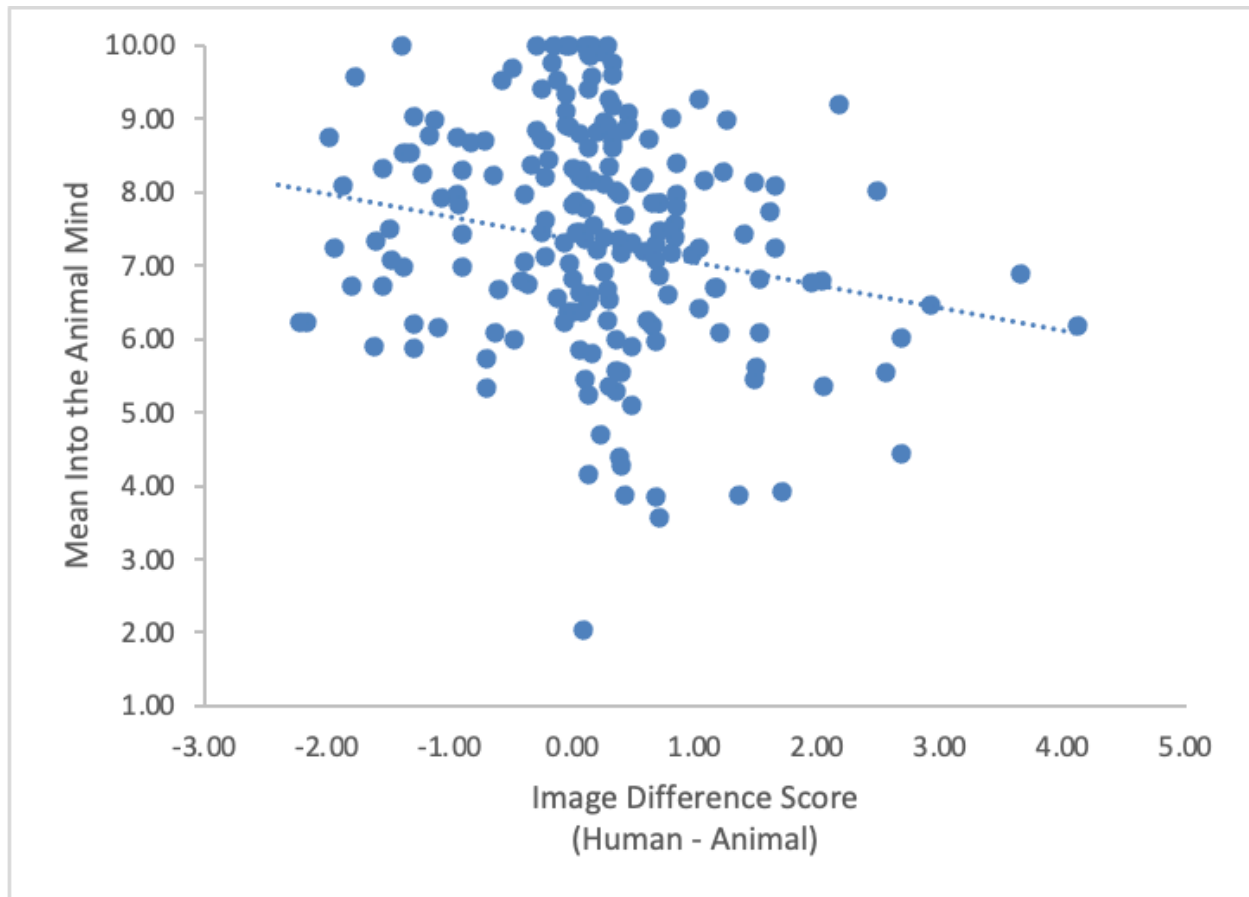
Figure 2b

Mean Image Ratings for Non-Religious Participants

Note. This figure shows the relationship of non-religious participant's condition on ratings of culture broken down by human and animal images.

Figure 3

Image Ratings and Animal Cognition Beliefs

Note. This figure shows the relationship between belief in animal cognition (Mean into the Animal Mind) and ratings of images overall (human image ratings – animal image ratings. On the X axis, a higher number indicates higher human   image ratings compared to animal images and a negative number indicates higher animal image ratings compared to human images.

Appendix A: Study 1 Survey

Appendix A1: Demographics

1. Do you currently have any pets? (Y/N)
2. Have you ever had any pets? (Y/N)
3. Have you been to a zoo, aquarium, or wildlife sanctuary within the last year? (Y/N)
4. How knowledgeable are you about wildlife?
    a. (1) Not at all knowledgeable–(7) Very knowledgeable
5. Do you believe that animals have culture?
    a. (1) Definitely no–(7) Definitely yes
6. Do you believe that animals have emotions?
    a. (1) Definitely no–(7) Definitely yes
7. Do you believe that animals are capable of complex thoughts?
    a. (1) Definitely no–(7) Definitely yes
8. Do you believe that animals are capable of complex cognitive functions?
    a. (1) Definitely no–(7) Definitely yes
9. Do you follow a diet that restricts your consumption of animals or animal products?
    a. Vegetarian
    b. Vegan
    c. Pescatarian
    d. Kosher/Halal
    e. Other dietary restrictions not listed (please specify):
    f. None of the above
10. Do you follow this particular diet because of your religious beliefs? (Y/N)
11. What is your religious background?
    a. Christian Protestant
    b. Christian Catholic
    c. Christian Orthodox
    d. Jewish
    e. Hindu
    f. Muslim
    g. Buddhist
    h. Sikh
    i. Agnostic
    j. Atheist
    k. Another religion not listed (please specify):
12. Do you believe in reincarnation? (1) Do not believe at all–(7) Believe very strongly
13. Generally speaking, do you consider yourself…
    a. Democrat
    b. Republican
    c. Independent
    d. Another political party not listed (open response)
14. Generally speaking, do you consider yourself:
    a. (1) Very Conservative–(7) Very Liberal
15. What is your highest level of education?

     a. Some high school
     b. Completed high school or equivalent.
     c. Some college
     d. Associate degree
     e. Bachelor's Degree
     f. Graduate School (Master's, PhD, Professional Degree, etc.)

16. Race (Please select 1 and note there is a mixed-race option):
     a. Asian
     b. Hawaiian or Pacific Islander
     c. Hispanic or Latino/a/x
     d. Caucasian
     e. African American or Black
     f. American Indian or Native Alaskan
     g. Mixed Race (2 or more categories above; please specify)
     h. Racial group not listed (please specify)

17. Ethnicity (Please select all that apply):
     a. Chinese
     b. Filipino
     c. Asian Indian
     d. Japanese
     e. Korean
     f. Laotian
     g. Thai
     h. Vietnamese
     i. Guamanian or Chamorro
     j. Micronesian (not Guamanian or Chamorro)
     k. Native Hawaiian
     l. Samoan
     m. Tongan
     n. Hispanic
     o. Caucasian
     p. African American or Black
     q. American Indian or Alaskan Native
     r. Ethnicity Not Listed (please specify)

18. Use this space if you want to elaborate on your ethnic background (Open Response)
19. What is your gender identity?
     a. Woman
     b. Man
     c. Non-binary
     d. Another gender identity not listed: (Open Response)
20. What is your age? (Open response)

21. Think of this ladder as representing where people stand in a country's society. At the top of the ladder (10) are people who are the most advantaged, those who have the most money, the most education, and the best jobs. At the bottom of the ladder (1) are those who are the least advantaged, those who have the least money, the least education, and the worst jobs or no job. Please select the number on the scale that best represents where you think you stand on this scale relative to other people in your country. (1, least advantaged - 10, most advantaged)

Appendix A2: Into the Minds of Animals Survey (Callahan et al., 2021)

https://osf.io/qsxrt/?view_only=dca2a1d26390437c9d84060625cd3a16

Thinking broadly about animals in general, do you see animals as capable of…
(0 = not at all capable, 10 = extremely capable)

22. experiencing embarrassment
23. playing (a behavior that is performed for enjoyment and not for any immediate survival needs)?
24. verbally communicating to members of a different species?
25. anticipating the outcome of their own actions before those actions are taken?
26. experiencing joy?
27. experiencing pride?
28. experiencing grief?
29. experiencing concern for the well-being of other members of their own species?
30. demonstrating problem-solving techniques to others?
31. being creative?
32. understanding how other members of their own species feel?
33. helping other members of their own species?
34. experiencing concern for the well-being of other members of a different species?
35. solving problems through trial and error?
36. experiencing greed?
37. distinguishing between members of a different species?
38. nonverbally communicating to a member of a different species?
39. experiencing jealousy?
40. appreciating art?
41. understanding what they know?
42. using tools in response to a need? (Where a tool is defined as an item the animals use as an extension of their own bodies)?
43. solving problems by imitating other members of a different species?
44. saving a tool in the anticipation of a future need?
45. making a tool in order to solve a problem?
46. solving problems by imitating other members of the same species?
47. cooperating with other individuals in order to reach a common goal?
48. understanding how other members of a different species feel?
49. remembering information in the long-term?
50. solving a problem that requires multiple steps in a specific order?
51. understanding that even when an object is not visible it is still in existence?
52. verbally communicating to other members of their own species?
53. having an imagination?
54. experiencing remorse?

55. surviving through instinct alone?
56. experiencing shame?
57. helping other members of a different species?
58. experiencing guilt?
59. intelligence?
60. experiencing consciousness?
61. having agency?

Appendix A3: Belief about the use of animals in society (Phillips & McCulloch, 2005)

Indicate how strongly you agree or disagree with the following statements,

7-point scale (1 = 'disagree very strongly'–7 = 'agree very strongly').
R indicates reverse coding

1. Transport of food animals, such as sheep or cattle, by road, involves little or no discomfort or cruelty.
2. Many wild animals suffer considerably from stress and boredom, as a result of being kept in zoos (R)
3. Keeping farm animals such as pigs and veal calves in small crates where they cannot even turn around is unacceptable (R)
4. It is better to euthanize (kill by lethal injection) unwanted dogs than to keep them alive in shelters/kennels/refuges for the rest of their lives (R)
5. It is acceptable to catch fish just for sport.
6. It is wrong to kill animals for food when vegetarian diets are available (R)
7. Surgically removing a cat's claws to stop it from scratching the furniture is acceptable.
8. It is acceptable to test cosmetics/shampoos on animals so that they will not harm humans.
9. Traps which injure the animal but don't immediately kill it are acceptable.
10. It is wrong to use animals (e.g., rats, mice) for scientific research (R)
11. The hunting of deer and foxes for sport is cruel and unnecessary.
12. The educational and entertainment value of zoos is far more important than any cruelty that may be involved in holding wild animals' captive.
13. The fact that intensively farmed pigs grow well and produce large litters of piglets shows that they are clearly not suffering.
14. As long as adequate food, warmth, and light are provided, there is nothing really cruel about battery hen farming (i.e., farming egg-laying hens in cages rather than cage-free)
15. Human beings are natural meat-eaters, so we shouldn't feel guilty about killing animals for food.
16. In scientific research, the advancement of knowledge comes first, even if animal suffering is involved in the process.

Appendix B: Focus Group Interview Questions

Culture definition:

17. What is your definition of culture?

18. What are examples of behaviors, practices, products, or other things you believe, without

a doubt, are culture?

19. Do all people have culture?

Animal culture:

20. Do non-human animals have culture?

    a.   Why or why not?

21. If yes, do all animals have culture or just some?

    a.   Which animals do you think have culture and why?

    b.   Which animals do you think do not have culture and why?

22. Can you think of any examples of animals exhibiting culture?

Animal cognition, sentience, and language:

23. Do you think animals feel the same emotions and feelings that humans do?

    a.   Are there any emotions you think animals do not feel?

    b.   Do you think animals have any emotions that are unique to them (i.e., humans do

        not have them)

    c.   Do you think animals can sense what other animals in their species are feeling?

    d.   Can you think of any examples of animals exhibiting emotions?

24. Do you think animals have their own language that they use to communicate with each

other?

25. Do you believe that human emotions and languages are an example of culture?

26. Do you think language and emotion are enough to demonstrate that animals have culture (or does "culture" involve more than that)?

Explicit reasons for beliefs:

27. What previous experiences do you personally have with animals?

28. Do you have any cultural or religious beliefs that could impact the way you think about animals?

Appendix C: Animal and Human Stimuli Example

Horses help each other to maintain cleanliness and appearance

Humans help each other to maintain cleanliness and appearance

Example stimuli for Study 2. Matched images of animals and humans participating in social grooming behavior.

Appendix D: Study 2 Survey

Appendix D1: Into the Minds of Animals Survey (Callahan et al., 2021)

https://osf.io/qsxrt/?view_only=dca2a1d26390437c9d84060625cd3a16

Thinking broadly about animals in general, do you see animals as capable of…
(0 = not at all capable, 10 = extremely capable)

29. experiencing embarrassment
30. playing (a behavior that is performed for enjoyment and not for any immediate survival needs)?
31. verbally communicating to members of a different species?
32. anticipating the outcome of their own actions before those actions are taken?
33. experiencing joy?
34. experiencing pride?
35. experiencing grief?
36. experiencing concern for the well-being of other members of their own species?
37. demonstrating problem-solving techniques to others?
38. being creative?
39. understanding how other members of their own species feel?
40. helping other members of their own species?
41. experiencing concern for the well-being of other members of a different species?
42. solving problems through trial and error?
43. experiencing greed?
44. distinguishing between members of a different species?
45. nonverbally communicating to a member of a different species?
46. experiencing jealousy?
47. appreciating art?
48. understanding what they know?
49. using tools in response to a need? (Where a tool is defined as an item the animals use as an extension of their own bodies)?
50. solving problems by imitating other members of a different species?
51. saving a tool in the anticipation of a future need?
52. making a tool in order to solve a problem?
53. solving problems by imitating other members of the same species?
54. cooperating with other individuals in order to reach a common goal?
55. understanding how other members of a different species feel?
56. remembering information in the long-term?
57. solving a problem that requires multiple steps in a specific order?
58. understanding that even when an object is not visible it is still in existence?
59. verbally communicating to other members of their own species?

60. having an imagination?
61. experiencing remorse?
62. surviving through instinct alone?
63. experiencing shame?
64. helping other members of a different species?
65. experiencing guilt?
66. intelligence?
67. experiencing consciousness?
68. having agency?

Appendix D2: The "New Environmental Paradigm" (Dunlap & Van Liere, 1978)

Indicate how strongly you agree or disagree with the following statements,

7-point scale (1 = 'disagree very strongly', 7 = 'agree very strongly'.).

1. We are approaching the limit of the number of people the Earth can support.
2. The balance of nature is very delicate and easily upset.
3. Humans have the right to modify the natural environment to suit their needs.
4. Mankind was created to rule over the rest of nature.
5. When humans interfere with nature it often produces disastrous consequences
6. Plants and animals exist primarily to be used by humans.
7. To maintain a healthy economy, we will have to develop a "steady-state" economy where industrial growth is controlled.
8. Humans must live in harmony with nature in order to survive.
9. The earth is like a spaceship with only limited room and resources.
10. Humans need not adopt to the natural environment because they can remake it to suit their needs.
11. There are limits to growth beyond which our industrial society cannot expand.
12. Mankind is severely abusing the environment

Appendix D3: Belief about the use of animals in society (Phillips & McCulloch, 2005)

Indicate how strongly you agree or disagree with the following statements,

7-point scale (1 = 'disagree very strongly', 7 = 'agree very strongly'.).

1. Transport of food animals, such as sheep or cattle, by road, involves little or no discomfort or cruelty.

2. Many wild animals suffer considerably from stress and boredom, as a result of being kept in zoos (R)
3. Keeping farm animals such as pigs and veal calves in small crates where they cannot even turn around is unacceptable (R)
4. It is better to euthanize (kill by lethal injection) unwanted dogs than to keep them alive in shelters/kennels/refuges for the rest of their lives (R)
5. It is acceptable to catch fish just for sport.
6. It is wrong to kill animals for food when vegetarian diets are available (R)
7. Surgically removing a cat's claws to stop it from scratching the furniture is acceptable.
8. It is acceptable to test cosmetics/shampoos on animals so that they will not harm humans.
9. Traps which injure the animal but don't immediately kill it are unacceptable.
10. It is wrong to use animals (e.g., rats, mice) for scientific research (R)
11. The hunting of deer and foxes for sport is cruel and unnecessary (R)
12. The educational and entertainment value of zoos is far more important than any cruelty that may be involved in holding wild animals' captive.
13. The fact that intensively farmed pigs grow well and produce large litters of piglets shows that they are clearly not suffering.
14. As long as adequate food, warmth, and light are provided, there is nothing really cruel about battery hen farming.
15. Human beings are natural meat-eaters, so we shouldn't feel guilty about killing animals for food.
16. In scientific research, the advancement of knowledge comes first, even if animal suffering is involved in the process.

Appendix D4: Demographics Study 2

17. Do you currently have any pets? (Y/N)
18. Have you ever had any pets? (Y/N)
19. Have you been to a zoo, aquarium, or wildlife sanctuary within the last year? (Y/N)
20. How knowledgeable are you about wildlife?
    a. (1) Not at all knowledgeable–(7) Very knowledgeable
21. Do you believe that animals have culture?
    a. (1) Definitely no–(7) Definitely yes
22. Do you believe that animals have emotions?
    a. (1) Definitely no–(7) Definitely yes
23. Do you believe that animals are capable of complex thoughts?
    a. (1) Definitely no–(7) Definitely yes
24. Do you believe that animals are capable of complex cognitive functions?
    a. (1) Definitely no–(7) Definitely yes
25. Do you follow a diet that restricts your consumption of animals or animal products?
    a. Vegetarian
    b. Vegan

    c. Pescatarian
    d. Kosher/Halal
    e. Other dietary restrictions not listed (please specify):
    f. None of the above

26. Do you follow this particular diet because of your religious beliefs? (Y/N)
27. What is your religious background?
    a. Christian Protestant
    b. Christian Catholic
    c. Christian Orthodox
    d. Jewish
    e. Hindu
    f. Muslim
    g. Buddhist
    h. Sikh
    i. Agnostic
    j. Atheist
    k. Another religion not listed (please specify):

28. Do you believe in reincarnation? (1) Do not believe at all–(7) Believe very strongly
29. Please indicate how much you believe in Evolution?
    a. (1 = does not describe my beliefs, 7 = describes my beliefs completely)
30. Please indicate how much you believe in Creationism?
    a. (1 = does not describe my beliefs, 7 = describes my beliefs completely)
31. Which belief comes closest to your view (select one) (Pew Research)
    a. Humans have evolved over time due to processes such as natural selection; God or a higher power had no role in this process.
    b. Humans have evolved over time due to processes that were guided or allowed by God or a higher power.
    c. Humans have existed in their present form since the beginning of time.
        i. https://www.pewresearch.org/religion/2019/02/06/the-evolution-of-pew-research-centers-survey-questions-about-the-origins-and-development-of-life-on-earth/
32. Generally speaking, do you consider yourself…
    a. Democrat
    b. Republican
    c. Independent
    d. Another political party not listed (open response)
33. Generally speaking, do you consider yourself:
    a. (1) Very Conservative–(7) Very Liberal
34. What is your highest level of education?
    a. Some high school
    b. Completed high school or equivalent.
    c. Some college
    d. Associate's degree
    e. Bachelor's Degree
    f. Graduate School (Master's, PhD, Professional Degree, etc.)

35. Race (Please select 1 and note there is a mixed-race option):
    a. Asian
    b. Hawaiian or Pacific Islander
    c. Hispanic or Latino/a/x
    d. Caucasian
    e. African American or Black
    f. American Indian or Native Alaskan
    g. Mixed Race (2 or more categories above; please specify)
    h. Racial group not listed (please specify)

36. Ethnicity (Please select all that apply):
    a. Chinese
    b. Filipino
    c. Asian Indian
    d. Japanese
    e. Korean
    f. Laotian
    g. Thai
    h. Vietnamese
    i. Guamanian or Chamorro
    j. Micronesian (not Guamanian or Chamorro)
    k. Native Hawaiian
    l. Samoan
    m. Tongan
    n. Hispanic
    o. Caucasian
    p. African American or Black
    q. American Indian or Alaskan Native
    r. Ethnicity Not Listed (please specify)

37. Use this space if you want to elaborate on your ethnic background (Open Response)

38. What is your gender identity?
    a. Woman
    b. Man
    c. Non-binary
    d. Another gender identity not listed: (Open Response)

39. What is your age? (Open response)

40. Think of this ladder as representing where people stand in a country's society. At the top of the ladder (10) are people who are the most advantaged, those who have the most money, the most education, and the best jobs. At the bottom of the ladder (1) are those who are the least advantaged, those who have the least money, the least education, and the worst jobs or no job. Please select the number on the scale that best represents where you think you stand on this scale relative to other people in your country. (1, least advantaged - 10, most advantaged)

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